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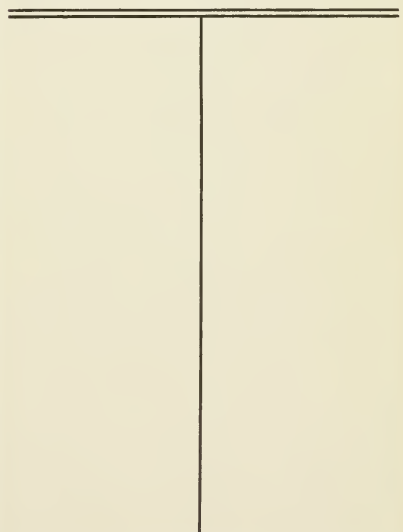
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OUR VANISHING FORESTS



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OUR VANISHING FORESTS

BY

ARTHUR NEWTON PACK

Associate Editor Nature Magazine

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TO MY WIFE
WHO SHARED WITH ME
THE LABOR AND THE PLEASURE
OF PREPARATION

11111

FOREWORD

By Col. William B. Greeley,

Chief Forester of the United States.

The forest is the background of America. We have built enormous industries upon its resources. We lead the nations of the earth in using its products. We turn to the woods instinctively for recreation. The forest is one of our great preservers. It feeds our lakes and streams. It shelters and renews our wild life. It has given moral stamina, self-taught resourcefulness, and bodily vigor to every generation of Americans.

It is time we balanced accounts with our forest. It is time we became growers as well as users of wood. It is time we acquired something of the forestry sense of the provident folk of the old world—the instinct to protect the woods, to plant a tree where no more valuable plant will grow. It is time we paid heed to our idle acres—that we restored woods, industries, and people on the large part of our soil which lacks them all.

To reach this goal much must be done by way of public effort. We need more public forests—na-

tional, state, municipal. We need a joining of hands on all sides to stamp out the forest fire. We need public control of the use of forest lands—fairly and reasonably exercised. But first of all we need forest-wise Americans. When forestry becomes a matter of common interest and everyday speech, when the idea sinks in that our forests are going the way of our buffalo unless everyone lends a hand, the game will be won.

W. B. GREELEY.

United States Department of Agriculture,
Forest Service,
Washington, D. C.
June, 1922.

PREFACE

What does the average citizen of the United States know about trees? He knows that they are beautiful, and he dimly recognizes that they are important to his welfare. Beyond this his reflections seldom go. According to a current story an orator once closed his stirring address with this peroration: "Is there a man in this audience who has ever done anything to prevent the destruction of our forests?" Up piped a small and timid voice from a rear seat, "If you please, Sir, I've shot woodpeckers." This is not perhaps a fair measure of the extent of public knowledge, but it does suggest that the public is withholding its attention from our great and vital forest problem.

"Our Vanishing Forests" is not written for foresters or for those who already possess a thorough knowledge of the economic importance of our forests. It is designed for Mr. and Mrs. Average Citizen, the man and woman in the home and in every walk of life, for it is upon them above all others that the solution of this great national problem depends. For the information briefly summarized in the chapters that follow the author is deeply

grateful to many whose long study and careful thought have done much for forestry. Especial thanks are due to Col. William B. Greeley, head of the United States Forest Service, who not only cooperated in furnishing information, but also personally reviewed the manuscript of this book; to Nelson C. Brown, Professor of Forest Utilization at New York State College of Forestry, a widely recognized authority on the uses of wood; and finally, to P. S. Ridsdale, Editor of "Nature Magazine," and Philip A. Rollins, author and historian, whose suggestions regarding presentation of the subject matter proved exceedingly helpful.

ARTHUR NEWTON PACK.

Princeton, N. J.

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OUR VANISHING FORESTS

CHAPTER I

SUCH STUFF AS HOMES ARE MADE OF

Lumber and wood for our homes; why we build houses of wood; home furnishings.

Centuries ago, even before the stone age, man's greatest friend was the forest, but it is hard to believe that he was then any more dependent upon its products than we in America are today. Perhaps the fact that the earliest settlers found this country one almost unbroken expanse of timber to the very limit of their travels, while their descendants for two centuries contended against the virgin forest for a livelihood, changed the character of western civilization. At any rate, we have been the last people in the world to commence to outgrow the wood-using habit, and as long as wood gives us less expensive dwellings and conveniences, and correspondingly higher standards of living than are found elsewhere in the world, why should we change?

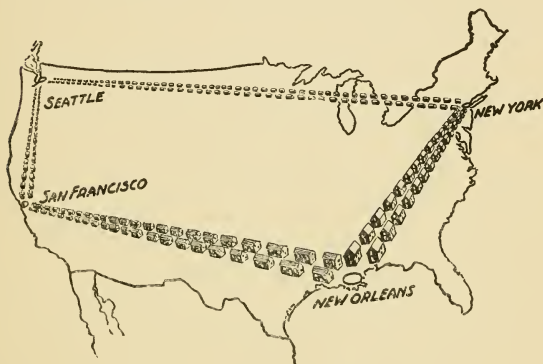
We people of the United States consume every year enough wood in the form of lumber alone to

build and furnish a double row of five-room houses which, spaced one hundred feet apart, would extend all the way from New York to Seattle, south to San Francisco and back again via New Orleans. What do we use it for? First and foremost for making homes. "Home Sweet Home" in America has always represented not a stone palace but a frame cottage. More American houses are built of wood than of brick, tile, stone or concrete all together. Many so-called fireproof buildings and others which do not show a wooden exterior have partitions, window frames, interior finish, rafters and roofs of wood, while stucco houses are often wood throughout with merely an outer coating of plaster.

Wood has been for many years and still remains the cheapest form of building material. For beams, joists and floors, it is the lightest and the most easily workable. It lends itself readily to the attractive results of painting and permits a variation of individual taste running all the way from colonial white to the darkies' idea of the *aurora borealis*. A properly built wood house possesses excellent qualities of insulation against heat or cold, and, indeed, scientific tests have repeatedly shown that wood houses can be kept cool in summer and warm in winter at a minimum of expense.

Are wood houses durable? The famous old dwellings of New England dating back to Revolu-

tionary and pre-Revolutionary times, the Washington homestead at Mount Vernon and countless others throughout the older section of our country stand in silent testimony. With the conflicting attractions of baseball and the "movies" we now feel that we cannot afford to take the same time and pains in building construction as did our forefathers,



We people of the United States consume every year enough wood in the form of lumber to build and furnish a double row of five-room houses which, spaced one hundred feet apart, would extend all the way from New York to Seattle, south to San Francisco and back again via New Orleans.

but we have recently discovered a few secrets that they did not know. How many people have repeatedly re-floored a porch, built new steps and renewed sills as part of the supposedly necessary upkeep of

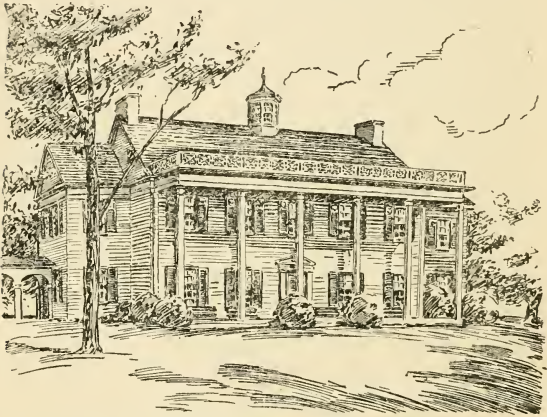
the home, simply through ignorance of the fact that decay could have been prevented. Paint has a mildly preservative effect which is more or less temporary, but the most modern and effective method of preservation is obtained by impregnating the lumber with coal-tar creosote or a similar product. These true preservatives, while affording a less pleasing appearance than does paint, have an ability to resist decay even under most unfavorable conditions, and, as a protection for the under and invisible portions of any wood structure, they are of the greatest value. The United States Forest Service estimates that no less than half of all the lumber consumed in the United States could be thus profitably treated, and, while railroads, engineers and bridge building companies now use creosoted timber as a matter of course, it is to be regretted that more of our architects, builders and lumber dealers do not avail themselves of its beneficial qualities.

The most discussed of all wooden house problems is the fire hazard, and nowhere have substitutes made more headway in the popular mind than in regard to the wood roof question. The makers of asbestos shingles and other patent roofing materials play up one set of statistics in their extensive advertising campaigns, while the adherents of wood put forward other and equally convincing facts. One

city enacts a regulation against the use of wood roofs in congested districts, while simultaneously the fire chief of another states that if wood roofs were the only fire hazard with which he had to deal, he would recommend that the fire department be disbanded forthwith. Dallas, Texas, rebuilt after its conflagration, enacted a law against wood shingles only to repeal it a few years later. The great fire of Chicago was stopped in a wooden house. A poorly constructed roof of too thin and improperly fastened shingles, which easily cup and warp to form a catch-all for sparks, is, of course, a disgrace to any community. This applies equally, however, to a house with a slate roof and a defectively built chimney. Properly laid wood shingles treated with a creosote stain will not readily cup, and a roof thus constructed is not in itself a serious menace.

The use of wood for furnishings within the home is of equal interest. The chair you sit in is a forest product, the table beside you, perhaps the bed in which you sleep. There is a story in every piece. Was that desk perhaps a family heirloom testifying to the sturdy construction and finer art of bygone generations? Look at it carefully. Perhaps it is rather a specimen of the cunning machine-made substitution now so frequently practiced with the

growing scarcity of really fine hardwoods, an inexpensive frame coated with thin sheets of handsomely grained veneer. Our best native woods for furniture making are white oak, hard maple and black walnut. Mahogany does not grow in the United States, nor does the beautiful Circassian walnut, but they are



The old Washington Homestead at Mount Vernon stands today as a proof of the durability of wood.

both cleverly imitated. Southern red gum and even California redwood, the wood of the world's largest trees, masquerade as mahogany, while in the cheapest furniture ordinary birch pretends to South African origin.

So much for outward effect. Woods may indeed be "doctored up" to deceive the unpractised eye, but usually time will tell. The ear, however, is seldom fooled, and for some of our most common musical instruments we depend upon the reverberant quality of certain species of wood. Spruce in particular possesses a high degree of resonance, its long and regular fibres being capable of vibrating like so many taut strings. Clean spruce lumber is therefore much in demand for the sounding boards of pianos and for organ pipes. The xylophone, so recently popular in vaudeville and dance music, is entirely dependent for its sound upon the vibrations of wood, and in fact the word, coming from the Greek, means "wood sound."

The uses of wood in the home are legion: picture frames, ornaments, carpet sweepers, broom handles, cedar chests, curtain rollers, shoe-trees, clothes-trees, coat hangers, drain boards, bread boards, ironing boards, clothes pins, clothes dryers, buckets, chopping bowls, knife handles, refrigerators, candle-sticks, lamps, clocks, and backs for toilet articles form only a partial list. The forest is the source. Our obligation to cooperate in its maintenance is commensurate with the debt that we owe.

CHAPTER II

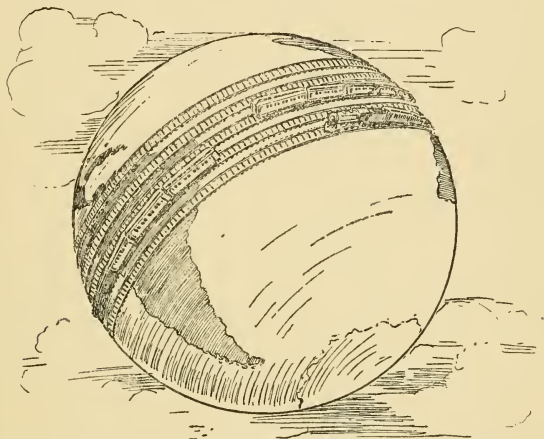
THREE THOUSAND A MILE

The use of wood in maintaining railroad transportation; wood cross-ties.

We Americans are great home-lovers, but we are also inveterate travelers, and there is hardly a man or a woman in the country today who has not made at least a short journey by rail. Did you ever stop to consider that under nearly every mile of railroad track lie more than three thousand wood cross-ties? Perhaps you have often seen the section gangs ceaselessly pulling out the worn and weakened sleepers to replace them with new wood, the piles of fresh ties and the burning heaps of discarded timbers. The railroads of the United States use about 125 million new wood cross-ties annually. When you realize that these ties would be sufficient to build forty thousand miles of road or carry a track nearly five times around the world at the equator, you get some conception of the drain on our forests necessary to maintain transportation.

The choice of wood for use as railroad ties de-

depends upon several well defined conditions: first, ability to resist ordinary decay; second, resistance to the crushing force of heavy rails and equipment; third, proper density to prevent the loosening and pulling of spikes; and lastly, a sufficient supply to avoid exorbitant cost. Once upon a time oak filled



The 125 million new ties required by the railroads of the United States every year would be sufficient to carry a track five times around the world at the equator.

every requirement, but today our oak forests have been so depleted that the railroads find difficulty in competing with woodwork manufacturers, furniture makers and countless other industries. This condi-

tion has taught railroad men how to get almost as good service out of cheaper wood properly treated and preserved, and accordingly southern pine now plays an important part, while Douglas fir and a dozen or more other species are used to suit various localities and conditions. The process of treating ties has been very widely standardized, the method employed being to place the prepared and seasoned wood in huge cylinders and there subject it at high pressure to creosote or some other preserving solution. Such treating cylinders now form part of the equipment of every important railway system, and creosoted ties may be seen under almost any track.

Someone has said that the greatest railroad tie expert is the hobo. He gradually learns to accommodate his stride to that peculiar length necessary for smooth progress along the right of way, and, if he cannot tell the difference between oak and chestnut, his weary feet can at least attest to a variation of surface. He thus stumbles literally upon the cause of a long standing controversy. If you carefully observe the ties under almost any important piece of track you notice that, while many of them may show a smooth flat surface, the majority bear the marks of having been hewn or flattened very irregularly. The former have been sawn by machinery, the latter have been hewn out by hand

in the woods. The hewing of ties is all individual work, one man being capable of making from fifteen to thirty-five ties a day. Very large trees cannot be economically handled in this way, those from ten to seventeen inches in diameter being preferable, but even then from twenty-five to seventy-five per cent. of the wood is lost in chips and split pieces. It is less wasteful to cut ties in a sawmill in the same manner as that in which other large timbers are manufactured, and indeed many railroads are beginning to appreciate the advantages thus gained. Sawed ties will also pile better, are less prodigal of preservative material, and offer a more uniform bearing for rails and tie plates. The advocates of hewn ties, however, claim that the conformity to the grain of the wood obtained by hewing renders this type of tie both stronger and more resistive to decay, and up to the present time the hewers appear to have had the best of the argument.

The price of all wood ties has increased so rapidly within the last few years that the railroads have been searching for a more economical substitute. In Germany cross-ties made of concrete and steel have proved extremely effective and given considerably longer service than wood. Our engineers, however, have found that while concrete and steel ties last very well under the lighter trains of

Europe—under the little “goods wagons” with their forty men or eight horse capacity—they lack the resiliency necessary to stand up under our larger and heavier steel equipment. Wood still remains as the only material able to endure the fearful American wear and tear. Perhaps some day the whole



The rate of consumption by our railroads attains the figure of four ties every second.

problem will be solved through aerial transportation, but that time has not yet come. We still depend upon the railroads and the railroads still depend upon the forests.

Something will have to be done to maintain the

necessary wood supply. In the past more emphasis has been laid upon the cost of cutting ties than upon growing them. This attitude will have to be changed. It takes an oak tree at least sixty years to attain sufficient size to make four or five standard ties, while many of the trees now used are well over a century old. It may be readily estimated that the present rate of consumption by our railroads attains the figure of four ties per second, or in other words these roads consume in one second what it has taken almost a century to produce. To grow oak trees for railroad ties, therefore, is not a proposition that will prove of general interest. Pine and fir trees, however, will reach a size suitable for tie manufacture in twenty to fifty years.

To plant a crop of trees and harvest them at maturity represents in this country a practically new field, but those who are sufficiently far-sighted to see beyond the next generation regard it as the only means of maintaining the supply of wood absolutely necessary to railroad transportation. Some years ago the Pennsylvania system carried on extensive tree planting along its right of way, but unfortunately for the advancement of the idea the wrong species were used and the results were for the most part unsatisfactory. Let us assume that a pine tree capable of producing five ties could be grown in

forty years, and then let us apply ordinary arithmetic. A crop of 125 million ties would require 25 million trees; that is to say, altogether about 900 square miles of forest. A permanent crop of 125 million ties every year would require 36 thousand square miles of carefully protected woodland, one-fortieth of which would be cut annually and immediately replanted. This is an area as large as the whole state of Indiana, but equivalent to less than one-tenth of the existing forest area of the United States.

Some such plan must unquestionably be adopted. As the available sources of wood are depleted, there is no doubt that tree planting on a commercial scale will become general. Public interest must steadily increase, and a timely consideration of the whole wood problem by government and state authorities will do much towards its solution.

CHAPTER III

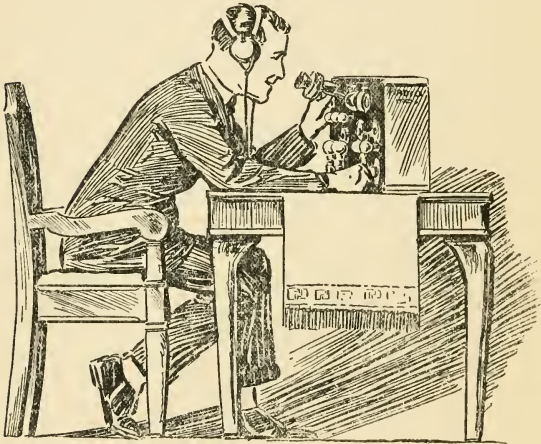
POLE TO POLE AND PILLAR TO POST

How wood helps us to maintain communication; telegraph and telephone poles; piles for piers and docks; wood as essential to the mining of coal and other products; wood fence-posts.

Today when the President of the United States makes a speech in Washington he is heard by audiences in New York, Chicago, and San Francisco. Thousands of miles of wire carry his words from Atlantic to Pacific, thousands of wood poles carry the wires. The wireless telephone too is finding its place in the broadcasting of public utterances; but there will have to be many improvements in radio operation before the poles come down.

And here we are once more dependent upon our forests. As each telegraph or telephone pole usually represents a single tree, no less than five million trees have to be cut each year to maintain the carrying of man's hasty messages. We have been particularly fortunate in America in possessing great forest resources of cedar, a wood slow to decay and yet reasonably strong. We have had

chestnut, oak and cypress, all particularly suitable for use as poles; yet, because we have considered the forests inexhaustible and have made no effort to see that a new tree should grow beside the dismantled stump, those species are rapidly vanishing.



Only when radio entirely displaces the ordinary telephone will wood poles be no longer needed.

Today thousands of cedar poles are brought from Idaho to supplement the diminishing eastern supply, but how long will the Idaho forests last? Will they not soon go the way of all the rest?

Fortunately the commercial use of wood preserv-

atives is coming to the rescue. Once pine poles were considered useless; they would rot away inside of five years, but today the butt is impregnated with creosote and the pole is then found to give twice the original length of service. It is now estimated that one pole in every six is made of creosoted pine, fir or spruce. There is no reason why these comparatively rapid growing species could not be re-established in the eastern and central states from which they have practically disappeared, why they could not be planted in even the smallest wood-lots, and why they could not be sold at maturity with considerable profit to the grower.

Wood poles are not used solely for carrying wires. How could we maintain river ferries or any form of steamship transportation without wood for piers, docks and piles? For ferry-boat slips nothing has ever been discovered to take the place of wood, its resiliency being necessary not only for preserving its own life but that of the vessels constantly crashing and chafing against the piles. Concrete and steel docks for large ships have been successfully built and operated in many places, just as steel frames set in concrete have been used as substitutes for wooden poles in high power transmission, but the original cost is considerably greater than that of wood construction. Think of the old wood pier on

which you used to sit and fish; think of the boardwalks at our seaside resorts; think of the wooden railway trestles whose comparative cheapness enables you to travel across great expanses of water at a fare no higher than if the road-bed were dry land. Then thank the forest.



Modern methods have made it possible for the ordinary farmer to treat his fence posts with a scientific preservative and thereby obtain from them a maximum of service.

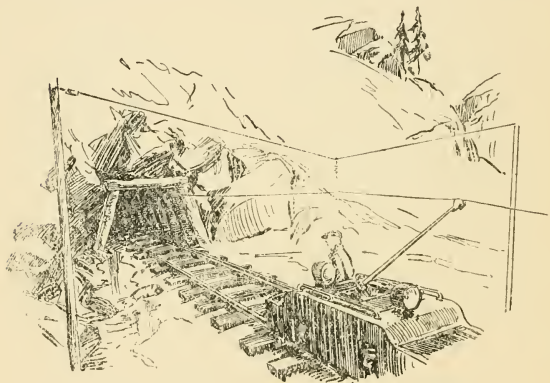
While cedar does very well as a pole intended only for carrying wires, it splits rather too readily under impact to give good service for dock piles and heavy trestles. Oak is most desirable, but creosoted pine and fir give service quite as satisfactory as do

the naturally more durable woods. The creosote incidentally performs another valuable service in that it protects the submerged portions from the attacks of nearly all salt water borers and worms.

Once upon a time an acquaintance with the art of splitting fence rails formed a part of every man's education. The old-fashioned rail has indeed passed, but not the wood fence post, and we still use no less than five hundred million a year. Fences today have a new use, not to keep the cattle in but to keep them out. A railroad train at sixty miles an hour can no longer stop to argue right of way with a stray cow, nor is it only a matter of paying damages in the amount of three times the value of the beast. The danger to the train itself is far more serious, and the railroads for their own protection have become the largest users of fencing materials. Fence posts come from all sections of the country and from nearly every species of tree. As the occasion may demand they are hewn, split or sawn from small trunks, or, in the neighborhood of large logging operations in the west, from tree tops and heavy branches left by the lumbermen. The swampy regions of the south are rich in suitable woods.

Here again preservative treatment forms the backbone of durability. Even before the develop-

ment of modern creosoting methods it was often customary to dip the butt end of the post into crude oil and then set fire to it, the consequent charring of the wood furnishing a protective coat. Today, however, the fence post maker sets up a couple of creosote barrels connected by an iron pipe leading



Without wood many of our important mining industries would be forced to shut down.

over a fire. He thrusts the posts vertically into the liquid, heats it, and then by allowing it to cool obtains the most thorough permeation. The ordinary farmer may in this way treat his own product at a cost of about ten cents per post, and at the same time he may be sure that his posts will give a maxi-

mum service. Generally speaking, the life of a creosoted post is about twelve to sixteen years, or twice that of one in the natural state.

Without wood tunnel props, shaft lining and ties for narrow gauge railroads the production of soft coal in this country would stop tomorrow. Our greatest remaining and hitherto undeveloped resources of iron ore can be successfully tapped only with the aid of wood, while many of our precious metals are found in strata so soft that thousands of wood supports can alone prevent a cave-in. Wood props are also used to a varying extent in anthracite coal mines, salt mines, lime quarries, and in every industry where tunneling is necessary. Indeed, for these purposes more than 200,000,000 cubic feet of wood are consumed every year.

The utilization of wood for the purposes enumerated in this chapter bears a very interesting relation to the solution of the whole wood supply problem. The public is now beginning to regard trees as an agricultural crop which must be planted and protected in the same way as any other, but there naturally exists considerable hesitancy in planting a crop which requires a lifetime to mature. Poles, fence posts, mine props and the like, however, may be cut from young trees fifteen to thirty years of age. They are rightly products of the local wood-

lot and as such they represent an early or advance yield which helps to return the investment cost and make it financially possible for the wood grower to await the development of the rest of his plantation. Government commissions and forestry associations are beginning to realize that the emphasizing of the short-time forest crop is essential to the accomplishment of their aim. It is the keynote to the successful growing of a forest near the ultimate market for its various products, and as such the foundation stone for a new low cost of living.

CHAPTER IV

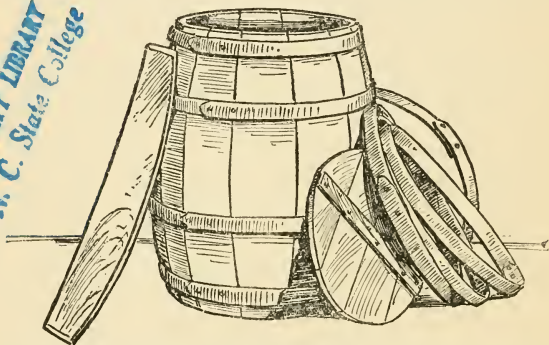
LITTLE WOODEN TOOTHPICKS TO BIG LUMBER WAGONS

Various diversified and interesting uses of wood;
boxes and barrels, and their manufacture; pencils;
scientific instruments; toys; paving blocks; sawdust;
excelsior, etc.

Some time ago in an Ohio town there appeared across the entire front of a lumber dealer's establishment this legend: "Everything from little wooden toothpicks to big lumber wagons." There is no doubt that the advertising power of the slogan caught the public eye, for it remained blazoned along the main street of the village for several years. If, however, this one dealer really pretended to keep even a sample of every wood product, his yards would have extended over half the town.

Among the more important articles made from wood are packing boxes and crates. In fact, some fourteen to twenty per cent of our total annual lumber-cut is thus applied. To be suitable for box making, wood must be soft and yet reasonably

strong, so that white pine held for many years the place of prominence, but as this wood became scarce and expensive, yellow pine from North Carolina and other southern states gradually took its place. A recent development in this industry is the making of box-board from wood pulp. The canners of fruit and vegetables use great quantities of all kinds



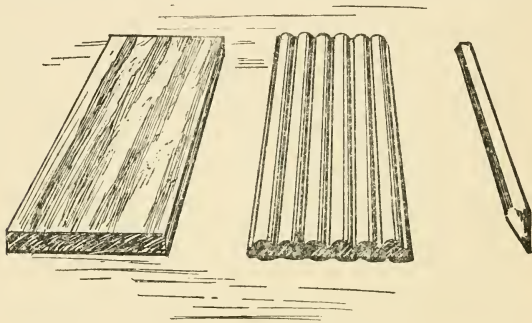
Barrels are generally manufactured piece-meal, one plant making the staves, another the heads, and a third the hoops.

of boxes for shipping their product. Fresh-fruit growers are the next largest users, the orange and lemon producers of California alone shipping no less than 20 million boxes of fruit every season. Most of the prepared box and box-shook manufacturers are located near the canneries and larger centers of population in the east.

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It is impossible to discuss this subject without also taking into consideration the many thousands of hard and soft-wood barrels produced by the cooperage plants of the country. Cooperage—barrels, buckets and other containers of that general construction—is of two main classes, slack cooperage which is intended only for solids, and tight cooperage which is capable of holding liquids. Both are interesting, not only because of the importance of the industry as a consumer of 250 million cubic feet of wood a year, but also because of the mechanical perfection of the process. Barrels are generally manufactured piece-meal—one plant making the staves, another the heads, and a third the hoops, each in widely separated regions, although, to be sure, the ownership may be the same. In the north our old friends beech, birch and maple are chiefly used for the best flour and sugar barrel staves, with perhaps pine for the heads and nearly always elm for the hoops. In the south staves are commonly made of red gum, this affording a very satisfactory barrel for molasses, rosin and the like. A barrel stave has no single flat surface. To produce it, special cylinder-shaped saws are sometimes used, but more often the shaping is done with a mechanical shearing knife after the wood has previously been steamed and softened. The hoops for slack

cooperage are either sawn or cut from green elm wood and appear as perfectly straight strips until boiled and placed in a coiling machine. Each of these component parts, having been manufactured in small or portable plants near the supply of the proper kind of wood, is then shipped to an assem-



The various steps in pencil making.

bly plant near the point where the barrels will be used.

The manufacture of tight cooperage consumes about fifteen per cent. of all the white oak cut in the country. Although hardwood staves are sawed rather than sheared to the proper form, the operation is very wasteful, about sixty per cent. of the material being lost in the shaping and close fitting necessary. In order to obtain greater strength flat

metal bands are here preferable to wood hoops. Because of the ever-increasing cost of tight barrels produced by the old methods, various experiments have been conducted with a wood-pulp or paper barrel, generally made in the form of layers of stiff paper held together by some suitable adhesive. Such a container may be both water-tight and weather proof. The inventors claim that due to elimination of the wastage above mentioned, a paper barrel can be produced at about one-third the cost of a regular wooden barrel, but as yet no large scale manufacture has been attempted.

It was at one time thought that the enactment of prohibition laws would have a very serious effect upon the tight cooperage business, as whiskey and wine barrels represented the highest grade product. As it happens, however, there has been an increase rather than a falling off in the industry; first, because of the many new discoveries of oil with increasing demand for barrel shipments, and secondly, because of the development of an export trade. Nearly twenty-five per cent. of our high grade barrel production is now purchased by the wine growers of France.

We do not have to go to a lumber yard to buy wood. We buy it in furniture stores and grocery stores, drug stores, book stores, and stationers.

Take lead pencils for instance. They are made in the United States at the rate of over a billion a year and require such an amount of wood that eastern red cedar and juniper have already become scarce



From the use of wood we obtain pleasure in many ways.

and a hunt is on for other suitable species. Pencil manufacture is a fastidious operation using only the finest heart-wood of the evergreen cedar. It seems a curious waste. The writing qualities of a pencil are in no way improved by the character of the

wood used, yet the trade demands not only good color and soft texture, but even the presence of a delicate cedar odor. For many years it was customary to allow the sap-wood to rot under damp conditions until it fell away, and to cut into pencil slats only the remaining heart. Now, however, this light colored sap-wood is made into pen-holders and similar articles. So-called paper pencils were once more popular than they are today. Their manufacturers thought that a pencil which would not require a knife to sharpen it would be a great step in advance, but the whittling public apparently decided otherwise.

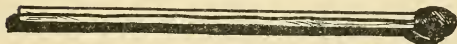
To make a wooden pencil the manufacturer first cuts out a board or slat about seven inches long, the width of half a dozen pencils and as thick as one-half a pencil diameter. With a special machine he then shapes it into six semi-rounded or semi-hexagonal sections and grooves one side ready for the "lead." The "lead" is inserted, the halves glued together and the pencil finished at some more convenient point. All our high grade pencils are filled with graphite which is not really lead, or even a metal, but, similar to coal, a product derived from decayed wood or vegetable matter. The best graphite comes largely from mines in Africa.

In the same class with pencils we may consider

all sorts of miscellaneous articles such as rulers, squares, spirit levels, thermometer backs, cameras, tripods, and various drafting instruments. In the manufacture of large cameras nothing has been found to equal the lightness and workability of wood. Each scientific instrument, however, requires different and special characteristics. The wooden back of a thermometer, for example, must be made from a wood that will not shrink or warp in such a way as to result in the breaking of the glass tube, while a carpenter's level must be hard and not easily sprung out of shape. For these uses black walnut and cherry respectively are the favorites.

Through the use of wood we obtain pleasure in many ways. The manufacture of musical instruments mentioned in another chapter is one example, but we should not forget the children's toys, or the part played by wood in our games and sports. From basswood, beech, birch, maple and pine are made the blocks that delight our earliest days, fit-together toys and tool chests for boys, toy furniture and dolls' houses for girls, and all sorts of toy animals from rocking horses to the fearfully and wonderfully shaped birds and animals that amuse even the grown-ups. Where would we be without baseball bats and golf clubs, tennis racquets and hockey sticks; without skis and snow shoes, bowling

alleys and billiard cues? Then there are rifles and fishing rods too, wooden decoys and patent fish baits. The woods used for these purposes range from good hickory for golf club shafts and dogwood or persimmon for the heads, to ornamental



The common match and the safety match. The first is made in America where we have had wood in abundance; the second is made in Europe where wood must be conserved.

ebony and mahogany; from ash and willow for baseball bats to the wood of the Christmas holly tree. We thus consume some twenty-five million board feet annually.

Matches and toothpicks seem like little things which would not require the use of much wood. It is natural to suppose that they could best be made from sawmill waste, but this is not the case. Because soft, absolutely clean material is necessary,

match manufacture is a distinct industry, obtaining most of its raw material direct from the forests, and consuming many thousand cords every year. The wood must not only be carefully seasoned and dried but one to which the inflammable head material will cling. A very ingenious mechanism is required to cut the wood first into blocks, then into strips and to dip the ends. Our large common matches are a distinctive product of America. The writer well remembers producing one from a private supply while traveling through England, and the laughing comment of a forester who remarked "No wonder you are using up your wood in America. Is that a match or a fence-post?" European countries use chiefly the small safety-matches made from thin sheets of veneer, such as spruce, basswood and aspen. These being square rather than round like our common matches entail less waste in manufacture. Very thin spruce veneer is also employed in the manufacture of safety-match boxes. While we produce safety-matches to some extent in the United States, we import some seven hundred million boxes annually.

Wood paving blocks are another specialized product. Until recently their use has been confined chiefly to city street paving, the smooth hard surface obtained being similar to asphalt but less slippery

and less noisy. Wood blocks for this purpose, being generally treated with preservative, have a long life and permit a correspondingly low cost of road upkeep. A more recent development offers wood blocks for factory and other inside floors where a maximum of wear is demanded. Like street paving blocks these are generally cut so as to offer the end of the grain at the surface, thus avoiding chips and splinters, and are grooved to permit the cementing fluid to secure a better hold. Wood block floors are becoming popular in plants where heavy car loads of material are constantly pushed to and fro.

Even sawdust plays an important part in our daily life. It furnishes the chief fuel for most of our sawmills, it is used for packing and storing ice, for the protection of breakable articles during transportation, for the covering and cleaning of floors, and in the manufacture of linoleum. Fine cedar sawdust is also utilized for polishing jewelry. In spite of our great lumber industry, and the vast quantities of sawdust produced and wasted, large consignments have occasionally entered our eastern ports from the Scandinavian countries. With reasonable freight rates, sawdust can be shipped across the ocean more cheaply than it can be brought to the Atlantic Coast from our great mill-
ing centers in the west, or collected from hundreds

of little mills scattered about nearer at hand. The utilization of by-products in Norway and Sweden is carried to a fine point, a large pile of sawdust being there considered worth several thousand dollars. An American lumber manufacturer in Louisiana or Oregon, however, would regard such an accumulation as a liability rather than as an asset and might even be willing to pay good money to dispose of it.

A similar product of special importance is excelsior, which, although merely thin curled shavings or shreds of wood, is no such plebeian material as one might at first suppose. Basswood is the aristocrat of the excelsior trade, but, because of its limited quantity, it furnishes only a comparatively small proportion of the supply. None of the better grades can be manufactured from gummy pines or from any wood with either a disagreeable odor or too brittle characteristics. Excelsior is best known as a packing material capable of protecting even the most delicate glass, but it fills a variety of needs from stuffing for mattresses and cheap automobile upholstery to the making of a kind of twisted rope used in the cast iron pipe industry. A very high grade of finely shaven excelsior known as "wood wool," can be used even for filtering purposes. This refined product ranges from one-sixtieth to one five-hundredth of an inch in thickness, and is about

one sixty-fourth of an inch wide. Experiments have been made with weaving it into mats and floor coverings, while the finest grades make an excellent absorbent for hospital use.

CHAPTER V

THE THRONE OF KING COAL

The fuel question; wood versus coal.

Do you remember the story of the poor little rich girl who had money and jewels to burn? America has so many riches, so many natural resources that one actually hinders the development of another. Europeans tell us, for example, that our very abundance of coal is partly responsible for the rapid disappearance of our forests. Continental Europe has enough coal for industrial purposes only. To heat their homes and cook their food most of the people use wood, and forest conservation, being essential to the supply of a clearly self-evident necessity of life, requires no explanation and no stimulus. We in America lack this direct touch, and our whole attitude toward the forest problem is governed accordingly.

Some years ago we burned a great deal of wood in locomotives and river steamers, but that is all past. Green hardwood is still used, however, to remove impurities in the process of smelting copper,

and to a limited extent in brick, tile, salt and wool manufacture. The sawmills utilize a very large quantity of their own mill waste as fuel, but chiefly because in many cases this represents the most economical method of disposal. Small quantities of cord wood are burned in the fireplaces of cities, towns and rural communities, but the real fuel-wood users are the farmers who are located too far away from the coal distributors for convenient and cheap delivery.

What the future will show in regard to the continuance of our coal supply is impossible to predict, but it is doubtful whether coal will ever have to yield its place of prominence to wood. The creation of great central power distributing units, such as has been suggested for the entire northeastern section of our country, will mean a great saving in the use of coal for industrial purposes and free large quantities for home use. Undoubtedly, it will also mean a general cheapening of electric power and extend the use of electricity for private purposes. Developments of this nature will permit the furnishing of electric light and heat to rural communities which have not hitherto enjoyed it, and wood fuel will thus be driven from its last important stronghold.

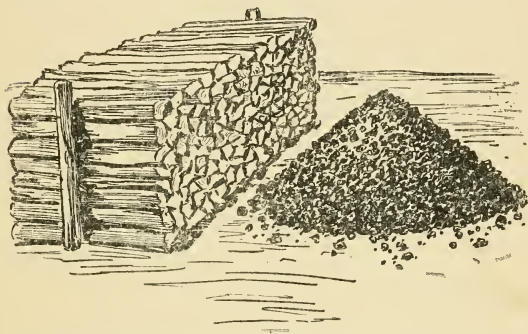
Why do we buy coal in preference to wood for

heating and cooking? It is not because coal itself is less expensive, for it is a fact that the amount of heat derived from one ton of coal costing fourteen dollars and one cord of hardwood costing ten dollars is about equal. No, it is really only a matter of convenience. Anyone who, during a coal shortage, has attempted to keep his furnace going with wood will testify that he does not care to repeat the experience. Central heating and constant stoking necessary to maintain a wood fire do not go together. Wood is too bulky and burns too quickly.

The unit of fuel wood is the cord, but this is in reality a rather indefinite quantity. It represents a pile of four foot lengths, four feet high and eight feet long, or 128 cubic feet, but there are usually so many rounded surfaces that the solid content varies widely. A crooked stick takes up more room than a straight stick, a few large projecting knots will cheat you out of a dozen billets. Indeed, the actual content of such a pile is usually estimated at about sixty to ninety cubic feet.

In this country fuel wood as it is found in the forest brings a small price. The six to thirteen dollars per cord paid by the ultimate consumer in our northeastern states is at least fifty to seventy-five per cent. labor charge. There is a tremendous amount of hand labor involved in tree felling, saw-

ing and splitting, and even when a gasoline saw is used to take the place of laborious bucking, there are many wages to pay. Add to this the cost of hauling and trucking to the wood yard and finally to the city man's back door, and you will appreciate the reason for an apparently high retail charge. In



The heat derived from one ton of coal costing \$14.00 and one cord of wood costing \$10.00 is about equal, but the cord of wood will weigh two tons, take up more storage space and require constant feeding to the fire.

certain southern and western sections of our country, however, sawmill waste can be delivered at the house door for as low as three dollars and a half per cord, and at this price the lumbermen are only too glad to get rid of it. Unfortunately, the gradual westward movement of the lumber industry has cut most of us off from the enjoyment of such benefits,

and it is a sad sight for the visitor from the east to see hundreds upon hundreds of cords feeding the mill burners simply because of the prohibitive cost of transportation. Perhaps it may be of some comfort to know that in many European countries, where wood is almost the only fuel, the pre-war price was equivalent to at least fifteen or twenty dollars per cord.

The person who burns wood at home often wants to know what kind to buy—what kind will give him the best return in heat or pleasant companionship for his money. It is a hard question to answer, as some love the snapping cheerfulness of a pine blaze, while others prefer the slow steady heat of a hardwood fire. The choice is also limited by the kind of wood available in the immediate vicinity. Hickory is a long burner and an excellent heat producer. Beech is a general all round favorite. Oak, birch, and maple, elm and cherry are also good fuel woods. The best of the pines is the Longleaf of the south; southern Shortleaf pine, hemlock, Douglas fir, gum, sycamore and soft maple forming a somewhat secondary group. Eastern red cedar burns with a pleasant odor, but produces only about half the heat of the hardwoods. Poplar, Norway and white pine, cypress, basswood, spruce and catalpa also belong in the inferior class, but when thor-

oughly dried are not undesirable. If firewood is in the least green a large proportion of the heat is used up in driving out the moisture and the result is so poor that it is generally best to buy the season's supply a year in advance and stack it in a dry place. Any kind of wood will burn when dry, but some char so rapidly that they tend to extinguish their own blaze. This last is particularly true of California redwood, and the consequent low fire hazard has been urged by lumber manufacturers in favor of using redwood in home construction.

The point to be remembered is that fuel-wood is not rightly a forest product but a forest by-product, and a large portion of the trees now used for fuel ought to be grouped into units for producing lumber, poles, pulpwood, etc. Our gradual appreciation of the need for forest growing foreshadows just such a development, as the thinning out of young and injured trees under proper forest practice, combined with the ordinary waste from wood-using industries, would furnish fuel-wood more than sufficient for all our needs. If the price of lumber and other wood products is to be kept at a minimum those thinnings and waste pieces must be sold. If we abandon the use of wood fuel in favor of coal and electricity, we must pay just so much more for the primary wood products, or in other words, just so much tribute to "King Coal."

CHAPTER VI

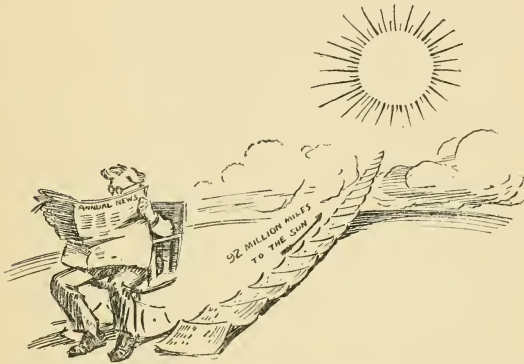
THE PAPER AGE

The uses of paper and wood pulp; newspapers and advertising; books, writing paper, wrapping paper, card-board, paper-board, papier mache, etc.

We are today living in a veritable age of paper. The annual value of all our paper and other similar products made from wood pulp, already not less than eight hundred million dollars, is constantly growing, and further developments are limited only by the supply of raw material. That material is wood.

Of all the paper that we see in various forms, newspaper naturally assumes the greatest importance. There are twenty-five hundred different daily papers published in the United States, besides some fifteen thousand weeklies and similar periodicals. The daily papers alone have a circulation in excess of twenty-eight million copies; in fact, over a hundred of them print more than a hundred thousand copies each every twenty-four hours. Astronomers tell us that the sun is something

like ninety-two million miles away, a distance so great that an airplane flying in a straight line could not cover it in a hundred years. Yet the various paper-making machines of the country turn out every year an amount of newsprint equiv-



Our annual production of newsprint paper is equivalent to a strip as wide as the ordinary daily and half the distance to the sun in length.

alent to a strip as wide as the ordinary daily paper and half the distance to the sun in length. Look at a Sunday edition with its hundred and fifty pages of news, stories, pictures, and advertisements. Many of us cannot help thinking what a waste it is. We read a few pages and put the rest in the scrap-basket. "I could get along without half of my daily

paper anyhow," we say, and then add perhaps, "Look at those pages and pages of advertisements." Very true, but the trouble is that the newspaper and periodical managers could not give us the reading matter and features without them. It is an established fact that the sale price of a newspaper barely covers the cost of the raw material that goes into it. Take a thirty page daily paper selling for three cents; the cost of approximately one-quarter pound of newsprint paper which it contains is about one cent, and the ink and printing expense fully make up the rest. Take a weekly publication like the "Saturday Evening Post"; five cents would not pay for that much blank paper. Where do the editors, reporters, printers and owners come in? Why, through the advertising profits. For a double page advertisement in a single issue of the weekly periodical just mentioned, the advertiser pays fourteen thousand dollars. If he finds the results worth the price, it cannot be altogether a waste. No, advertising is a legitimate industry, but advertising could not be carried on without wood pulp.

Next in importance to newsprint comes book paper. The latter is a much higher grade product, requiring a special chemically made pulp, while clay and rosin are added in order to obtain the desired texture and weight. The presence of the clay ex-

plains why a page taken from a book will not burn so rapidly as a newspaper.

Then, there are the fine writing papers. Many of them used to be manufactured almost entirely from linen rags, but of recent years the cost of such



Every day in the year several thousand trees find their way into our wastebaskets.

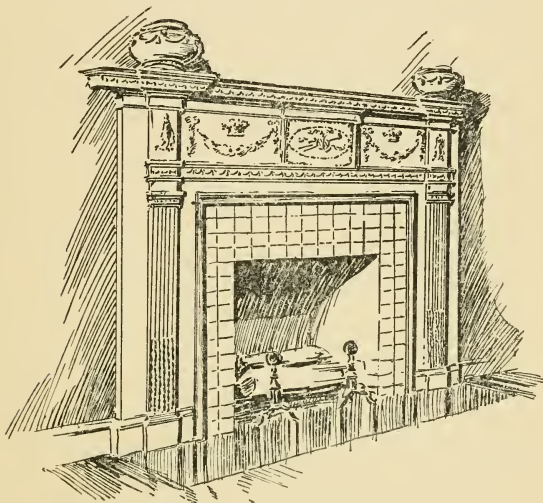
material has been so high that it has been necessary to introduce in all the cheaper grades a very large admixture of wood pulp. Tissue papers are also made from rags or trimmings of high grade paper combined with varying quantities of new wood pulp.

Every little store in the country has its roll of

paper for wrapping and packing, while large shops are often obliged to keep a special warehouse continually stocked with many tons of coarse brown stuff to cover the insides of boxes and crates. There are other uses of this product. Only a short time ago the manager of one of the largest Hawaiian pineapple companies reported that his concern was using many tons of heavy paper, not merely in wrapping and packing, but in planting. A roll of heavy paper is laid out on the ground and the pineapples planted through holes, thus tending to prevent all weed growth adjacent to the plants. This process obviates the necessity of hoeing, protects the roots and leaves, and prevents the ground from being baked too hard or washed away.

Think of the builder's paper for lining roofs and walls, for covering floors, etc.! Think of the various substitutes for wall plaster—great thin sheets of heavy cardboard-like material made largely from compressed wood pulp, with perhaps a mixture of asbestos as a better fire preventive! During the recent war, it was this material that made possible the construction of the countless huge temporary office buildings in Washington. In 1917 the War Industries Board reported that the sale of this product amounted to a hundred and fifty-six million dollars per annum.

Blotting paper is only a sheet of wood pulp mixed with a short fibred cotton to increase its absorbent power, while similarly paste-board and other special



Wood pulp in the form of papier mache is often pressed into molded ornaments for ceilings, walls and mantel-pieces. Many lacquered bowls and dishes are also made from wood pulp and old paper boiled and ground up with glue or paste.

papers represent the use of a large quantity of wood. Fortunately, these materials are generally manufactured where waste paper can be obtained,

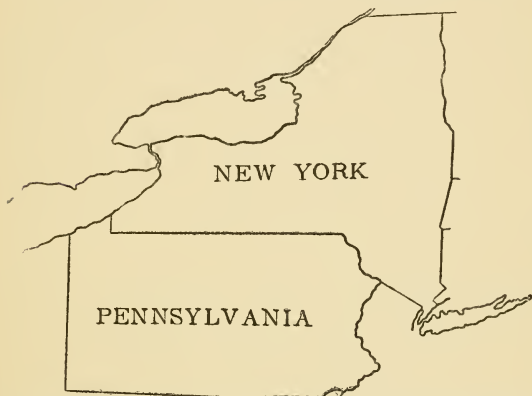
and that, along with sugar cane refuse and other fibrous materials, forms the chief ingredient.

A department store would certainly hesitate to make a window display of "paper" stockings, nor would the term be correct. Nevertheless the raw material used for artificial silks is largely the same as that used in paper manufacture, and spruce fibres, obtained by a chemical process, are woven into hosiery and other articles quite as effectively and durably as real silk-worm silk.

Many lacquered bowls and dishes are made of wood pulp and old paper boiled and ground up with glue and paste. This material, known as papier maché, has recently been used very widely for interior decorating effects. Pressed into molded forms of flowers, baskets and other ornaments for ceilings, walls, mantel pieces, etc., it is very easily handled and somewhat less brittle than pure plaster. Celluloid, which is ordinarily a product obtained from cotton cellulose treated with nitric acid, has also been manufactured from wood pulp. Indeed the list of all wood pulp and paper products is endless.

The pulp and paper industry faces the future with even less confidence than do the majority of wood users. It is so highly organized and so vast that it long ago began to look ahead and wonder

where its future raw material was to come from. Already over a third of our entire pulpwood supply is grown across the Canadian border, and Canada, profiting by our mistakes, is now taking steps to restrict the cutting of timber. This means that our



A dense and continuous forest the size of New York and Pennsylvania together might under proper management furnish a perpetual supply of wood for paper manufacture.

annual importation of Canadian pulpwood has practically reached the maximum, and for the remaining two-thirds we will have to look after ourselves.

Only a few years ago paper manufacturers thought spruce was about the only wood they could

use, but the spruce supply was not unlimited, and balsam, hemlock, and many hardwoods began to be mentioned with it. Brown paper manufacturers learned to use the yellow pines from the south, Jack pine and even Douglas fir, where supplies were available, and paper came to be made from sawmill waste. This latter development, however, has been much handicapped by the fact that the sawmills have gradually receded to the west and left the sister industry behind. There are, of course, a number of paper makers on the Pacific Coast, but generally speaking, large enough contiguous supplies of the proper wood to justify the great expense of putting up plants are comparatively rare. Paper manufacturers are looking for the future even to Alaska where there is still hemlock and spruce in abundance. Remember, however, that if paper is to be made five thousand miles away, the ultimate consumer will have to pay the cost of transportation.

A number of experiments have been carried on in an attempt to manufacture paper out of other materials than wood, like corn stalks, straw and certain grasses. It is possible to make some kind of paper from any vegetable fibre, but as yet nothing has appeared that can compete with wood in cheapness, availability and adaptability. The solution of the problem of raw material for paper making still

lies only in the careful protection and reforestation of timber lands. Supposing that it takes about fifty or sixty years to grow good pulpwood spruce and that such a growing forest could be protected from fire and other losses, a tract of about one hundred thousand square miles of forest could then, under proper care and management, produce the desired wood crop to furnish a perpetual supply for pulp manufacture. This means an area about the size of New York and Pennsylvania together, but is less than our present area of really waste lands which the United States Department of Agriculture says could readily be put into growing forests.

There is no question but that the Paper Age can be continued, but it is equally clear that without a very great change in present methods, and probably in present costs, we will some day find ourselves like Australia and New Zealand, in the position where a man who prints thirty pages in one daily newspaper stands a good chance of landing in jail. There must be first a proper national forestry law, there must be state cooperation, and there must be a willingness on the part of the public as well as the industry to cooperate.

CHAPTER VII

FOREST TO PRINTING PRESS

Wood pulp and paper making.

Logging for pulp making is not far different from the process of getting out logs for lumber, but since it is possible to cut the wood into short lengths at the start, the problem of transportation is much simplified. Although most paper companies own their own land and cut their own wood, many private owners of forests and wood-lots near these industries find a ready market for cord-wood of the proper size. A large company in the south recently made special efforts to stimulate pine growing among the farmers in its immediate neighborhood, while in New Hampshire cord-wood in four foot lengths is a readily marketed product of the farm wood-lot. The pulp and paper companies are beginning to recognize that the stimulation of the wood-lot idea is important to their future, not merely for the sake of the few additional cords thus obtained, but because, through the farmer's appreciation of the value of wood, he becomes eager to cooperate in

the all important question of fire protection. The maintenance of every wood-using industry, and thus indirectly of the future supply of all wood products for home or commerce, will depend more and more upon the amount of cooperation given by the public.

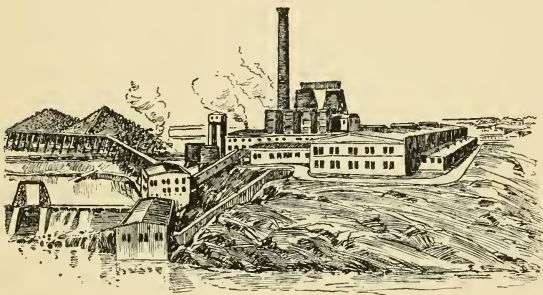
The increasing shortage of pulp-wood has had a most interesting effect upon the price. In 1916 the rate paid for rough wood delivered at the mills varied between \$4.00 and \$11.00 per cord, while during the boom in 1919 the same wood brought from \$15.00 to \$18.00. This naturally resulted in stimulating the interest of the local farmers and land-owners. Although a condition of temporary over-production existing throughout the country has since meant a practical cessation of buying wood in the local market, we are no further away from a paper shortage in 1922 than we were in 1919 and '20. In the long run the money value of all wood on the stump cannot lessen, but with a realization of the diminishing wood supply is bound to increase.

At the mill the wood bolts are stacked by machinery in great piles to supply the machines throughout the year, and the process of manufacture begins. The first step is the removal of the bark, as the presence of bark fragments greatly weakens and discolors the finished product. This process is usually conducted by putting the billets

into a huge barrel-shaped container which constantly tumbles them against rows of spikes; but hand labor is also needed for a thorough job. There are two general types of wood pulp; that made by grinding the wood billets against huge stones under a continuous jet of water or steam, and that obtained from dissolving chips in an acid. The first method is the simpler, but since the grind-stone tends to break the wood fibres, paper made from groundwood alone would not possess much strength. Where acid is used, the fibres come out whole. Ordinary newspaper is a mixture of about one part chemical pulp to three or four parts of groundwood, while writing paper, book paper, wrapping paper and the like are chiefly made from chemical pulp only.

The secret of paper manufacture lies in having the pulp absolutely clean and free from impurities. It has to be washed, stirred and beaten, and washed again and again before the material is ready to mix with the necessary rosin or other sizing material and be rolled into paper. A large supply of thoroughly fresh and clean water is therefore absolutely essential. The pulp, carried about in liquid form, eventually comes into the paper room and sprays onto a thin screen which leads over and under a series of very hot rollers until the pulpy sheet has

hardened sufficiently to carry its own weight. Then the screen leaves and the sheet, continually being dried by the steam heated drums, hurries on the length of the room to a great roll at the end. Frequently in the manufacture some little weakness develops and the sheet tears across. In such an event, before the machines can be stopped, the whole room may be filled with damp paper and the



The wood bolts intended for pulp manufacture are usually floated down the river to the mill where they are stacked by machinery in great piles to supply the machines throughout the year.

attendants fairly overwhelmed with its billows. This waste, however, goes back into the beaters and soon comes out again in liquid form for another try. Modern machines produce newsprint at very high speed in rolls fifteen to seventeen feet wide.

The chemical processes of pulp making are ex-

ceedingly interesting, but the writer would advise all those suffering from a supersensitive nose to content themselves with a mere description and keep away from the factory. Commercial methods vary, but all involve cooking wood chips in a strong chemical, repeated washing, and then perhaps evaporation of the liquor to reclaim the valuable acid salts. Newsprint-making usually employs the so-called "sulphite" process, in which various compounds of sulphurous acid form the basis. Sulphite pulp makes up over one-half of all the chemical pulp produced in the country. This method works very well for spruce and similar light woods which do not have a very heavy resinous content, but such woods as pine, which furnish a very large percentage of the pulp for wrapping paper, cardboard and the like, have to be somewhat differently treated. Compounds obtained from sulphuric rather than sulphurous acid are here used, sodium hydroxide and sodium sulphite being the principal digestive agents. The "sulphate" process as distinguished from the "sulphite," at present only accounts for about three per cent. of our total chemical pulp, but has great potential importance for the manufacture of so-called Kraft paper from sawmill and forest waste. An older and somewhat better known process for treating hardwoods and other species

which cannot be conveniently handled by the "sulphite" method, boils the wood chips under pressure with caustic soda.

The manufacture of groundwood pulp—that is, the pulp obtained as above mentioned from grinding alone—is comparatively simple, but in addition to its drawback in producing very short fibres, it requires a tremendous amount of power and can only be carried on where such power is available and cheap. Steam in sufficient quantity is usually too expensive, so that direct water power or hydroelectric development at the plant is absolutely essential. This has been an important factor in determining the location of the chief pulp and paper manufacturing centers.

With its favorable combination of wood supply, adequate power, clean water and accessibility to the market, New York State has been one of the leaders in paper making. Maine, New Hampshire, Pennsylvania and Wisconsin belong in the same group, while Virginia and West Virginia are not far behind. In the central section of the country, Michigan still leads, but we must skip over to the Pacific Coast to find in Oregon the few other important developments. There is no doubt that the utilization of southern pine mill waste under the "sulphate" process, will tend to bring such states as

Louisiana, Mississippi and Arkansas very much more to the fore, as material sufficient for the manufacture of many thousand tons of paper daily is there available.

CHAPTER VIII

A FRIEND UNRECOGNIZED

Chemical uses of wood; the tanning of leather; charcoal; alcohol and other products of wood distillation; dyes made from wood.

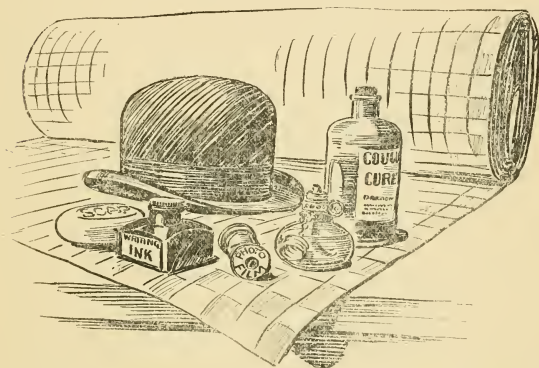
Wood comes to us through the chemical industries in many other strange forms. Let us take tanning materials for example. Tannin is what may be called an astringent—a soluble agent acting upon animal skins in such a way as to preserve them and render them pliable, strong and, to a degree, waterproof. It is found in nearly all varieties of wood but only in a few to a sufficient extent to be commercially valuable. The art of tanning was understood long before America was discovered, having probably been practised even by the ancient Egyptians. The American Indians knew how to preserve deer skins by the use of hemlock bark, and as the country grew, this bark became the chief commercial source of tanning materials.

From these small beginnings has grown up an American industry whose product is valued at over

two hundred million dollars a year, its output in shoes alone amounting to some 250 million pairs. In so far as tannin is obtained from bark alone, and the rest of the tree is used for lumber, the tanning industry has no great effect upon our wood supply. Unfortunately, however, the difficulties of transportation have sometimes resulted in hundreds of peeled logs being left in the woods to rot. The wood of the chestnut tree also contains a high percentage of tannin capable of extraction, and today about two-thirds of all the tannic acid produced in the United States is derived from chestnut trees cut for this exclusive purpose. California and southern Oregon possess an asset of great value in the native tan-bark oak which has been widely exploited, while the forests of Washington and Oregon contain, still untouched, great quantities of western hemlock. This latter wood, although quite different in many characteristics from its eastern relative, is also a tannin producer, but, as it happens, the western forests are too far away from the chief centers of the tanning industry, and it pays better to import from the abundant supplies of South America and Europe rather than foot the railway bill.

Charcoal is another interesting wood product. It is chiefly used in the manufacture of iron and steel,

but also for the making of gun-powder and explosives, in the chemical and metallurgical industries, for fuel as in jewelry manufacturing, and for medicinal purposes. Charcoal alone could easily become a drug on the market for there is any quantity of forest and wood waste suitable for



These and countless other products we owe to the chemicals obtained from wood distillation.

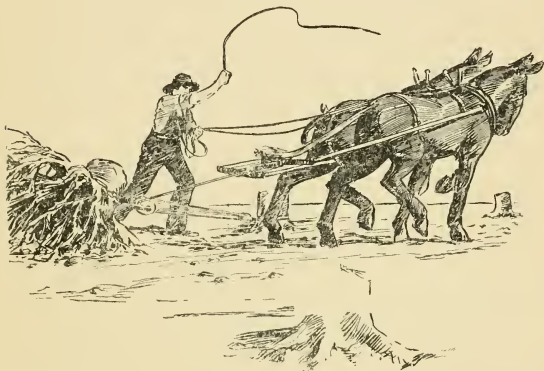
cheap manufacture to meet the limited demand. However, it is produced in most sections chiefly as a by-product of wood distillation, and since the latter industry still maintains itself in the east near the market for its product, while the principal lumbering industry has moved to the south and far west,

not waste but new wood direct from the forest is utilized. The old problem of forest exhaustion and distribution thus adds about a million and a half cords a year to the nation's wood bill.

The distillation of hard and soft woods is handled by different methods. The modern hardwood process, devolving from an original pit or brick kiln method, uses batteries of metal oven-retorts heated by coal or coke. The gases which are thrown off while the wood is charring and later cooling are collected with very little loss, and are then further distilled for the manufacture of the extremely valuable products upon which the industry is founded. The first of these is acetate of lime, a chemical used very largely in the textile and leather industries. During the war it was in great demand for the making of high explosives. A better known product is wood alcohol, used chiefly in paint and varnish manufacture, but also in the preparation of dyes, photograph films, and even in stiffening hats. We know it best as a fuel for small lamps and, when taken internally, as a deadly poison. The wood-tar residue is generally used as fuel in chemical manufacture. Nevertheless, under the name of wood-creosote, it has considerable medicinal value and there is some likelihood that, if the process of manufacture could be sufficiently cheapened, a broad

market might also be found in competition with coal-tar creosote as a wood preservative and disinfectant.

The principal products of soft-wood distillation are turpentine, rosin and tar oils. This turpentine



By the use of portable distillation retorts the land owner who desires to get rid of tree stumps may obtain at least a partial return for his trouble and labor.

generally does not have as good a market as that obtained by bleeding the living trees, but is satisfactory for making paints for the outside of buildings. The rosin skimmed off during the refining process is used in the manufacture of linoleum, ink, soap and paper. The tar-oils are employed in the paint

industry or may be further refined for medicinal purposes, while the pure tar which remains is largely sold for caulking ships.

Soft-wood distillation has a great future in the south as a means of utilizing not only the waste of the lumbering industry, but also the stumps obtained in clearing the ground for agricultural purposes. Recently considerable attention has been given to the manufacture of portable distillation retorts, by the use of which the farmer or other land owner, who desires to get rid of tree stumps, may obtain at least a partial return for his trouble and labor. In some instances such operations appear to have been quite profitable.

A similar and even older use of certain varieties of wood is in the manufacture of dyes. Vegetable or tree dyes preceded modern aniline dyes by many years and were until about 1865 the principal source of all our dye stuffs. With aniline dye competition the trade fell off, but in 1914 with the outbreak of war and the practical cessation of aniline imports, vegetable dyes again attained considerable importance.

Butter-nut as a dye material was well known to the American pioneers who probably learned of its quality from the Indians, but the yellowish color is not very satisfactory. The Red Man, too, through

his desire for a striking color, first utilized the Osage Orange, a tree native to portions of Arkansas, Oklahoma, and Texas. In appearance it is rather irregular growing and stunted, but valuable for decorative purposes. The heavy, hard and durable wood is also much in demand for wagon and vehicle making. The coloring extract is chiefly found in the wood itself, but comes also from the bark and roots, and under the trade name of "Aurantine," is considered a valuable and useful dye capable of withstanding light or washing. Although best used on wools it can also be applied to paper, wood, leather, and cotton, where it gives various shades of orange, gold, tan and olive. Many thousand tons of this wood, representing refuse from the vehicle manufacture above mentioned, are now wasted every year because conditions have not apparently justified an extension of its use in competition with aniline colors. Many dye-woods are imported from South and Central America and the West Indies, but the only other North American tree at present utilized for this purpose is sumach, and that only to a small extent. Used on cloth and fine leather it also gives a yellow tone. We sometimes hear the claim that vegetable colors in general are more durable than the coal-tar aniline dyes. This is not necessarily true and future developments

will rather depend upon relative costs and ease of application.

The chemical industries are constantly finding new uses of wood. One such recent discovery permits the production of ethyl- or grain alcohol, as distinguished from the wood alcohol previously mentioned, while others have even made possible the manufacture of baking powder and live stock feed. These processes are of course complicated, but all of them are now graduating from the field of mere experiment to that of real economic value. Indeed wood is a vast reservoir of organic material and its ultimate uses through the developments of creative chemistry are almost unlimited.

CHAPTER IX

SYRUP AND SAP

Products obtained from growing trees; maple sugar, turpentine, wood creosote, tar, etc.

Who, as he stood before the window of a Child's Restaurant watching the white capped chef turning golden brown disks on the griddle, has not smacked his lips at the thought of wheat cakes and maple syrup? But do we ever stop to think of where that syrup comes from? The American traveler in foreign lands may look far, yet nowhere can he find this particular delight. Maple syrup is a unique product, an annual crop from a tree crop, and yet only one illustration of the many sided usefulness of trees. Our forefathers apparently learned of it from the Indians, but, as the methods then employed were exceedingly crude, various improvements have since been necessary. In our most modern maple sugar operations the sap is collected in covered metal buckets fastened to the trunk, piped or hauled on sleds to a central point, and evaporated in pans divided into successive compart-

ments. For every four mature trees in his "sugar bush" the operator may obtain as much as one barrel of sap, which in turn will boil down to a single gallon of pure syrup. Under the old methods it was often necessary to cook the sap continuously for upwards of twenty-four hours, but today, the new style evaporators have reduced the time to about seven hours.

The Sugar Maple, a native of New England, New York, Pennsylvania, Ohio and other lake states, is the source of our chief supplies. It is a friendly tree, willing to live in a great variety of soils and locations, but seldom a rapid grower. A really large specimen, three or four hundred years old, may be only a little over one hundred feet tall and its largest trunk diameter about four feet. Nevertheless this tree is easy to plant and cultivate, and with patience there is but little difficulty in establishing a "sugar bush." Curiously enough the so-called Black Maple is considered by many, especially in and about Vermont, as superior to its cousin both as to quantity and quality of sap, while in the Central States the Red Maple plays a limited part. It has the advantage, at least, of being a more rapid grower. The Silver Maple and several others are of minor importance.

Although cane and beets control the common

sugar markets, the status of maple products as luxuries cannot be injured, and the demand has steadily increased. The rate of production, however, remains in the neighborhood of 45,000,000 pounds per annum. About seven-eighths of the total product is adulterated with corn syrup or other



Founding the maple sugar industry.

sugars before it reaches the ultimate consumer, and as he usually does not know the difference, it is very difficult to secure really pure maple syrup. A few of us, however, who have come to know its pale golden color and unexcelled taste will have naught to do with the darker commercial product. Indeed

it is really this ease of cheap adulteration and the facile gullability of the public, which limits the amount of production. There is no shortage of sugar-producing trees. Their value, like that of fruit and nut trees, is too well appreciated.

Maple syrup is far from being the only important product of tree sap. As mentioned in the preceding chapter, turpentine, rosin and wood-tar are sometimes obtained by distillation of pine wood, but our chief supplies of these products come rather from the sap of the living trees. This is an old and important industry, dating back to the time when wood-tar for caulking ships was the chief product desired, and indeed all turpentine and tar products are still known as naval stores. Several hundred years ago a famous French minister, desiring to protect a rich wine growing land from the storms of dune sand blowing in from the seacoast, planted a large area in southwestern France to maritime pine. As a matter of fact he not only accomplished his immediate object but laid the foundation of Europe's turpentine industry. In this country a number of our southern pines are equally productive, and today as one rides on the train through sections of Georgia, Florida, Alabama, Mississippi and Louisiana, nearly every pine tree appears to be hung with small earthenware cups.

For many of our large southern lumber companies, the production of naval stores has been a source of considerable revenue. Proper turpentin-
ing does not seriously affect the strength of the wood or its usefulness as lumber, nor is the process



The production of naval stores has played an important part in the economic development of the South.

necessarily harmful to the living trees. It is possible, of course, to milk a tree to death, and improper methods have resulted in much killing of pine timber—particularly small trees—but periodical tapping with recuperative periods in between has proved economically sound. The common practice

in this country, however, is to begin turpentine several years before the tree is to be cut down for lumber, keeping the production continually at its maximum capacity. Turpentine operations are not merely seasonal but require constant watching to empty the receptacles, scrape off the gummy rosin from the face of the scar, and repeatedly re-chip the wood.

Owing to the inflammability of the gum, very thorough fire protection is necessary. In our southern states, however, it is often satisfactory to clear a space about each tree and then deliberately burn the rest of the area, the brush and dried grass which might cause an accidental and really dangerous conflagration being thus destroyed.

The products obtained are similar to those of soft-wood distillation, but it is generally considered that spirits of turpentine distilled from resinous sap are of higher grade, and they accordingly bring better prices. The operation differs, however, in that the wood itself is not distilled but only the semi-liquid rosin, and copper and iron retorts accordingly take the place of air-tight charcoal ovens. The distillate, which comes from a worm shaped copper condenser, is collected in barrels and the turpentine skimmed off. The remainder is more or less pure rosin.

It will be remembered that the chief use of turpentine is for thinning paints and varnishes, but it is also used in cloth printing, in the manufacture of rubber articles, and in a great variety of other chemicals and medicines. Rosin is used chiefly in soap making, but also in paper manufacture, for water-proofing barrels, and in making linoleum, ceiling wax, oil-cloth, roofing, lubricants and ink. Small quantities are utilized by the chemical industry in innumerable other ways.

The value of naval stores produced in America approaches forty million dollars per annum, but this amount is not all consumed at home as our exports are very large. Florida is the chief producer with Georgia and Louisiana next. The industry has in the past played an important part in the economic development of these regions, but, due to the rapid depletion of the timber supply, it is now waning. Possibly the southern farmers and small land owners, following the example of the maple sugar growers of the north, will develop sufficient foresight to remedy the situation, but there is a serious difficulty to be encountered. The unit hitherto necessary for profitable production of naval stores, consists of from ten to twenty "crops" of about ten thousand scars or "boxes" each, and, although there may be a considerable number of

boxes to the acre, this means that a minimum unit requires in the neighborhood of two thousand acres of well timbered land. If the difficulty is solved it can only be through some such cooperative system of sap collection and distillation as will permit the effective use of small wood-lots.

CHAPTER X

TREES AND TORRENTS

The value of growing forests as a means of protection against erosion, landslides and floods; afforestation in relation to city and town watersheds and water supplies.

Every spring we read of the great damage caused by cloud-bursts and floods, of lives lost, and property swept away. It is always difficult to assign a specific reason for such catastrophies of nature, but we are now beginning to realize that the denuding of the forests is, in part, directly or indirectly responsible. It cannot be denied that trees alone through their interlacing system of tiny roots and through the layer of spongy humus which they engender, conserve the moisture from melting snows or sudden rains, and allow it to trickle slowly through without washing off the soil, while a forest cover also tends to break the force of rain, and shades the snow so as to allow its gradual melting.

The influence of large areas of forest in stabilizing rainfall should also be considered. There are no hard and fast rules to be applied. A single lim-

ited forest can have no appreciable effect, but it may be safely accepted that over large areas forests do have a very tempering influence. The upper hills and mountains are often swathed in clouds without a drop of rain falling, but trees through their leaves

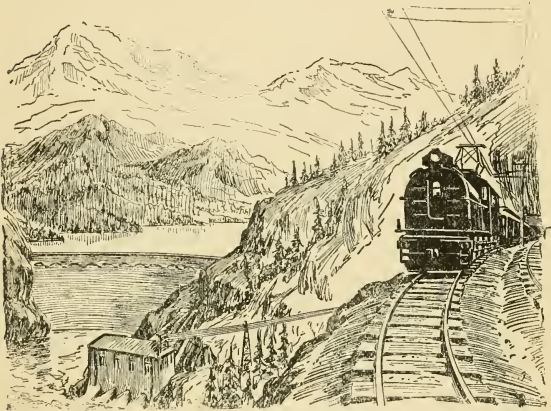


For catastrophies of this nature forest planting is the only permanent remedy.

or needles act very much like the wick of a kerosene lamp, catching the moisture from cloud and fog and allowing it to drip upon the ground, thus continually feeding the streams and watering the valleys below. Careful observations made over a period of many years as between a wooded mountain section and a

neighboring treeless area, have conclusively proved that the wooded section receives more regular and constant watering, while, at the same time, it is reasonably free from the terrors of cloud-bursts.

Not only do the railroads and the towns beneath



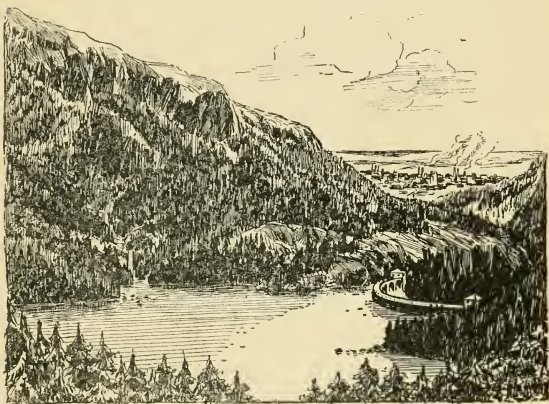
The control of mountain torrents through the creation of forests means a broad extension of irrigation and also of hydro-electric development.

the mountains need protection, but also the meadows must be continuously watered and made safe for farming and cattle grazing. What does the expenditure of a few millions amount to if it will mean an increase of many times that sum in a nation's food production? The United States Gov-

ernment has recognized this in its reclamation projects, namely, the building of the great dams for permanent water supply and irrigation in the west, and in its acquisition of areas along the important watersheds as National Forests. To deal with specific sources of trouble and actually replant the forests needed as a protection, is only a step further. The difficulty is that under our system of democracy federal or even state action is a slow process. We have seen so many attempts to exploit the government for the benefit of private individuals that our law-makers have become somewhat suspicious of every project now suggested; yet with growing necessity, increased public interest, and education as to the possible remedy at hand, these objections will be banished.

But let us see how other nations regard this problem. The French and Swiss governments lay implicit faith in forest planting for protective purposes. Where the great and important links of railway cross the Alps and Pyrenees a veritable plague of landslides was once suffered, but in recent years the damage has been almost negligible. How do these governments go about it? A great landslide scar with its potential danger from loosening rocks and soil cannot be cured by merely sowing handfuls of tree seed, for after the damage has

once been done the soil is too loose and unstable. The first step usually involves the construction of walls, dams, reservoirs and artificial stream beds to confine the future course of the water; the inter-



Although it is much easier to obtain tremendous sums for engineering works to tap and control a known water supply, a number of our well informed men believe that forest planting and protection would accomplish the desired object better and more cheaply than an excess of reservoir construction.

mediate spaces must then be anchored by transplanting tough rooted grass and shrubs; and then at last nursery grown tree seedlings may be brought in as a beginning of the permanent forest cover. The operation often requires years of labor and the ex-

penditure of enormous sums, but it is the only real cure.

Europe regards forest planting and forest protection from another angle too, that of encouraging water-power and hydro-electric development. Her governments have progressed much further than we along the lines of successful cooperation with private enterprises. France and Germany often encourage water-power development, and at the same time control it by taking a sort of partnership in the enterprise. It has frequently been established that, where thorough forest protection and extension is practised, a maximum steady flow of the desired water-power is obtained almost entirely without the very large and expensive storage reservoirs which are customary and necessary with us. The trees themselves regulate the flow from the melting mountain snows and conserve it to such an extent that it continues throughout the year.

Flood prevention, therefore, is only part of the problem. The value of trees as water conservers merges equally into a question which comes far nearer to most of us town and city folk—our own city water supplies. Only a few years ago New York City completed its vast underground river to a point sixty miles away in the Catskill Mountains, yet, although still well supplied, she is mindful of

her rapid growth and continues to maintain a corps of engineers in the field. The reservoirs of the present system have been built large enough to hold the maximum run-off from all the surrounding slopes, but the city has not entirely disregarded the value of trees, and many acres about its reservoirs have been afforested. Although it is much easier to obtain tremendous sums for engineering works which will tap and control a known water supply, a number of our well informed men acquainted with the European developments above mentioned, believe that forest planting and protection in America would accomplish the desired object better and more cheaply than an excess of reservoir construction. While admitting the value of trees in this respect, let us neither be too hasty in large scale experimenting nor too backward to profit by the coming extension of forest growing and wood-crop cultivation.

The city of Newark, New Jersey, recently acquired a very large acreage in the nearby hills contiguous to its water supply. Part of this area already has a considerable forest cover and such sections as need it are gradually being planted to extend the great sponge which feeds the reservoir. Incidentally, a fine park and recreation ground for the people will thereby be created.

Newark is going only a step further with an idea

already proved valuable in Connecticut and other states, but especially in England. The water supply of the great city of Liverpool comes from the English "lake district" so well known to most travelers. There the "catchment areas," as they are called, are carefully planted and maintained, and although most of the forests have not yet attained a very considerable age, they are already beginning to yield to the community some profit from their wood products. The British Government, which has recently adopted a very comprehensive scheme of afforestation in England, Scotland, and Wales, has arranged to cooperate along this line with all the cities and towns, endeavoring to furnish seedlings for planting as well as technical advice. The economic value of the wood products is emphasized, and the cities are shown how the profit thus obtained may not only pay the interest upon the bonds sold for construction, but also furnish a sinking fund. What a difference in comparison with most of our cities' financing, wherein bonds to cover improvements are sold without thought of obtaining any revenue except such as may come from the taxpayer's pockets!

CHAPTER XI

THE WORLD OUT OF DOORS

The aesthetic importance of the forests; parks and recreation grounds; memorial tree and roadside planting; birds and animals of the forest.

Are we such a money-loving people that only commercial values and a foresight to provide for our future needs and comforts can count? I think not. What would childhood become without the forest, without the forest stories of "Little Red Riding Hood," "The Babes in the Woods," "Sleeping Beauty" and "The Three Bears"? And grown-ups flock to "Peter Pan." There is something intangible about a tree which has made it through generations one of man's best friends. Last summer I journeyed through the devastated regions of northern France. It was not the "Zone Rouge" or the worst scenes of devastation that interested me most—like many Americans, I had seen enough of that during the war—but the roads rebuilt, and the little towns and villages rising again from the flat plains. They looked better and cleaner than before

the war, for modern methods have introduced notable improvements, but something was lacking. Where were the little clumps of woodland, the orchards, and the welcome shadows before the doorway? They were gone, and all that great region



Can anyone say that we do not love and care for trees when we choose them as memorials to those who fell honorably for their country?

which had once carried some subtle old world appeal now lay staring, for all the world like some mushroom city of the western plains.

Even when America was still a vast unbounded forest from the Atlantic to the prairies, there were

some to cry "Woodman spare that tree," and it is with something of this old love for trees, a desire to see a little of America as it used to be, that over six million people visit the National Forests every summer. The National Parks, like Yellowstone, Glacier, and the big tree groves of California, also come in for their share of tourists and campers, and indeed the attractiveness of these parks as public playgrounds is created in large measure by the presence of the grand old trees. Repeated schemes for commercial exploitation have fallen before the weight of an overwhelming public opinion. If we are willing to travel hundreds of miles for but a few weeks of forest recreation, what if we could have the woods everywhere at our very doors? The artificial planting of shade trees and orchards has transformed parts of Southern California from a treeless desert to a far-famed paradise. What if the environs of every city, village and town could be made into a vast park?

Fifty years ago the legislature of the State of Nebraska created Arbor Day as a state holiday to be devoted to the planting of trees by school children. A very large portion of that state consisted of flat fertile prairie where trees were particularly needed to afford shelter to man and beast from the beating summer sun; but Nebraska was not alone

in that necessity, and within a few years the idea spread to nearly every state in the Union. It has been developing ever since; first the planting for roadside protection and school yard beautification, and then the development of the town and city shade tree commission for protection and conservation of the growing trees which are such a feature of urban and suburban beauty.

Then came the war. Can anyone say that we do not love and care for trees when we choose them as memorials to those who fell honorably for their country? From the Atlantic to the Pacific has spread the new memorial service of tree planting. Along our highways stands an ever increasing memorial line; in our parks appear sturdy oaks, elms and maples bearing the names of soldiers. Cities, states, men's clubs and women's, have all taken up the work. One Post of the American Legion has already begun the planting of a real memorial forest. Beginning with a few plots promised for the purpose, and for which the New York State Forestry Department has already set aside some two hundred thousand seedlings, the men of the Herkimer, New York, Post will acquire and plant about five thousand acres of land. They have gone beyond the individual memorial idea to that of a monument perpetually renewed, a monument such

as no stone or marble could accomplish in that it will itself, from its wood yield, furnish funds to aid the injured and care for the disabled.

The memorial tree idea will never stop within the uses of its present purpose. It is going on al-



The present high prices of furs are in part the result of forest destruction.

ready. Recently a railroad corporation planted an honor row of trees for employees who had been fifty or more years loyally in its service, and now close upon this, a plan has been suggested for a vast forest park memorial to the essential unity of all English speaking nations.

And then, there are the forest birds and animals. Indeed birds are nature's foresters, for they require no appropriation from a Department of Agriculture to pursue their work of devouring insects and other destroyers, which are alike the enemy of farm and city dwellers. Even the much criticized hawks and owls prey upon rabbits and mice which live by gnawing the bark of young seedlings. Bird lovers, therefore, from befriending the birds came to befriend the forests, and, while trees still seemed to stand as an obstacle to the advance of civilization, societies were already setting aside woodland lots where the feathered tribe might dwell and multiply unmolested. It is significant, perhaps, that one of the many ways in which America has extended the hand of friendship to crippled Europe has been in the gift of bird houses and feeding stations for the protection of birds in the few remaining woods of Belgium and northern France.

The animals of the woods are important in a different way. Their value lies chiefly in skins, furs and food, but unless there are forests in which they may live and multiply, those supplies will soon cease. Although we no longer rely upon game it nevertheless furnishes us many million dollars worth of food every year. In England the propagation of game has been one primary reason for the existence of

forests. The revenue from shooting permits has often been found to pay the taxes on such woodlands and completely maintain them until they reach maturity and are ready to be cut and replanted. Indeed, when the submarine menace and the transport of American troops resulted in a serious curtailment of British food imports, that game, long before planted and carefully preserved, saved the lives of countless people.

Hunting may be either a benefit or a menace, depending upon the character of the huntsman, or the regulations enforced. It is certainly of benefit, however, in that every year it brings six or seven million men and women into contact with the Out-of-doors; and if the lives of great men remind us truly, contact with the forces of nature thus engendered, has been one of the broadening influences of the world. In molding public opinion to save the forests, nature lovers have led the way, and there is for them a great present opportunity, not through mere unfounded criticism of supposedly heartless lumbermen, but through such an understanding and knowledge of the whole problem as will permit cooperation in a common cause.

CHAPTER XII

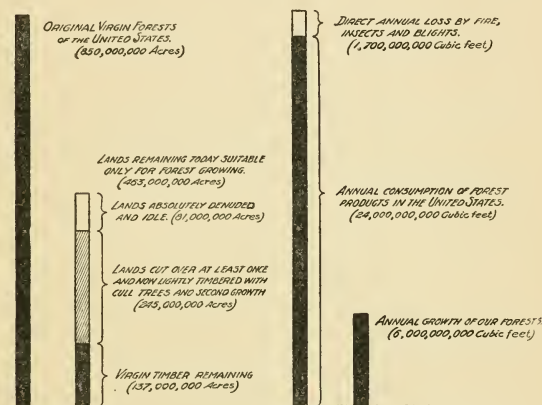
IMPENDING CATASTROPHE

Our vanishing forest resources; Europe shows us the remedy.

Perchance if the reader has followed the story of the forest thus far, he has learned something of the debt he owes to its myriad products, its protective influence, and its broadening effect upon the human race. A mere encomium, however, is not enough. We may praise to the skies the source of our blessings, and still shut our eyes to an immediately impending catastrophe. When America was discovered a vast forest covered almost the whole of the eastern and southern sections of the country. It gave way to the treeless prairies of the middle west only to begin again at the Rocky Mountains and extend with but few breaks for occasional deserts and dry valleys to the Pacific, a total estimated at 850 million acres.

Where is it today? Half of our original forest has been cleared for farms, industries, and cities.

The other half, comprising about 463 million acres, is still classified as forest land, but here too the forests themselves have largely disappeared. Only a total of 137 million acres located almost exclusively in the far west and south, still contains virgin



If the present rate of forest destruction is maintained, it is safe to estimate that within the lifetime of a child born today our timber resources will have practically vanished.

timber. The balance, amounting to 326 million acres, is widely distributed throughout many eastern, southern and western states. Three-fourths of this land is covered with second growth and cull trees, while the remaining one-fourth, or 81 million

acres, has been so badly treated that the land now lies absolutely denuded and idle. And the destruction goes on. The best estimate of the growth of all our remaining forests shows an increment of 6 billion cubic feet of wood a year, while we cut in a single year about 24 billion cubic feet, and allow forest fires, insects, etc., to destroy nearly 2 billion cubic feet more. If this rate of destruction is maintained it is safe to estimate that within the lifetime of a child born today our present timber resources will have practically vanished.

Who is responsible for this condition? Is it the lumbermen? Indirectly, yes, but *fundamentally, no*. The lumbermen have been repeatedly assured that our forests were inexhaustible. When they had successively finished cutting in New England, Pennsylvania, New York, and Michigan, they were told to "Go south, go west; there you will find timber enough to last for untold generations." They did so. So vast did those forests appear that their exhaustion seemed impossible. Today we are told that at the ordinary rate of consumption the great pineries of Mississippi and Louisiana cannot last over fifteen years, while even the western forests are rapidly disappearing. It was all a colossal mistake based purely upon ignorance. In terms of billions the mind fails to function, and a few years ago

even public spirited leaders of governmental departments were unable to see whither our destructive forest policy was leading.

Those sections of our country from which the lumber was first cut are already beginning to feel the effect. Our northeastern states are not now able to produce more than ten to fifteen per cent of the



A large portion of the lumber used by our eastern states has to be hauled clear across the continent.

wood they necessarily consume. Pennsylvania, which was but a short time ago the leading state in lumber production, now manages to find only enough wood in its forests to fill the needs of the city of Pittsburgh. Train loads upon train loads of lumber from the Pacific Coast start daily across the continent. Three thousand miles is the distance from which the New England States obtain much of their wood supply, and indeed between one-half and two-thirds of the price of lumber in most of our northeastern district goes not to the producer but to the

railroads. It has been estimated that the people of Connecticut alone thus pay a freight bill of over \$3,000,000 per annum.

The immediate effect of this situation is not, as one might suppose, the elimination of waste, and the closer utilization of the wood in every tree, but quite the reverse. When the western lumberman must obtain his logs from the rough mountain fastnesses, when he receives for his product less than one-half of its eastern wholesale value, he can afford to cut only the best and most easily workable trees; he can sell at a profit only the best and clearest lumber. The rest? It is left in the woods, or burned on a rubbish pile to avoid cluttering up his yards. Many of us have witnessed the dreadful aftermath of logging operations in the west: a tangle of discarded trunks unavoidably knocked over in the struggle to bring out the good logs at a limited cost, great heaps of tops and branches with pillar-like stumps projecting through, a raging conflagration set by some careless spark, and then utter desolation.

In Europe the situation today is far different. At the gates of nearly every city and town on the continent lie pleasant looking woodlands which, with little change in their outward appearance, furnish a permanent source of wood and lumber free of trans-

portation charges. Those miniature forests are not there for beauty alone but as the basis of the nation's wood supply. They are there because two hundred years of practical experience has proved that their maintenance is in dollars and cents, or francs and centimes, a profitable investment. Indeed, one may actually find towns whose inhabitants have not for years paid one cent in taxes because the communal forest revenue has been sufficient to meet all public charges. The known vagaries of political administrations might cast some doubt upon these reports of great success and generous profits, but when we find private corporations also owning forests and perpetually maintaining them at a comfortable profit, as is the case in France, Germany, Switzerland, Norway and Sweden, we must recognize that the matter is worth investigating. I myself have never visited one of these propositions without thinking of our own clubs and private preserves of the Adirondacks, the Catskills, and the White Mountains, and of the great potential wealth that might some day be there developed.

The whole forest policy of European nations rests upon one basic principle. Every time they cut a tree they take care that another shall grow in its place. In actual practice this is most often accomplished by the logging of selected specimens pre-

viously marked in accordance with theories and precepts more than a century old. First just a few trees are removed to allow the light to filter through the leaf canopy and permit new seed to germinate in the soil—the “seeding cut,” they call it—then,



The whole forest policy of European nations rests upon one basic principle. Every time they cut a tree they take care that another shall grow in its place.

several years later, a few more old trees to give the young ones a better chance; and finally when the new forest is safely established under the old, down come the remaining mother trees and it is only necessary to await the beginning of the next cycle.

Cutting at a rate commensurate only with annual growth is all very well, you say, but here in America wood products are so implicated in our daily affairs and play so large a part in maintaining our standards of living, that any restriction upon the rate of consumption would mean nothing less than a catastrophe. There is just one alternative, and that is to increase the size and productivity of our forests; in other words, grow more trees. That we have plenty of idle land near our great wood-consuming centers, land suitable only for forest growing, is evident to the casual traveler, and the fact is being better emphasized every year through the reports prepared by the Federal Forest Service and the newly constituted forest commissions of our states. Remember that 81 million acres is the present estimate of denuded and idle areas alone, and that there are also 245 million acres of very sparsely timbered land which is nevertheless capable of intensive tree cultivation. With the necessity of meeting high freight rates the immediate adoption of scientific forestry methods in the far west would very likely prove unprofitable, but in our northeastern states the problem is quite different. The sum now paid for transcontinental haulage might far better be expended on forest protection and cultivation right at home.

In many sections efficient fire prevention is all that is needed to permit a natural re-stocking of the land, but unfortunately a few of our eastern forests have been destroyed by axe and fire beyond the possibility of valuable natural reproduction. In such cases the only alternative is to start from the very beginning with artificial planting. Can we overcome this obstacle? France, in her regions devastated by the German army, is facing a similar question; England with one-half of all her woodlands cut clean for war purposes expects to re-establish them on a better basis than ever. How do these nations hope to go through all the labor of planting trees and through all the years of waiting thereafter, and still find the operation profitable? Simply because public interest is awakened, because the people, knowing that they have to have lumber and wood, face their problem squarely and honestly. They, *must* seek every possible means, they *must* combat every difficulty, in short they *must* accept the cost or go without. When that slogan becomes ours, we too will eventually succeed.

CHAPTER XIII

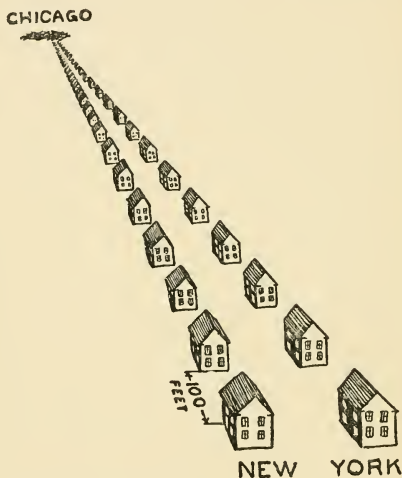
THREE-QUARTERS OF THE WAY

The first step—elimination of the forest-fire menace.

We cannot afford to restrict our consumption of wood. What is the alternative? The right course—the only remaining plan to pursue—is to grow more trees. The chief of all impediments to forest growing is the forest fire. Every year forest fires devastate some eight or ten million acres of land. Incidentally, they destroy enough good timber to build a row of five-room frame houses spaced one hundred feet apart on both sides of a highway from New York to Chicago. But the mere destruction of existing trees is by no means the worst feature. When fires re-occur periodically on the same land, finally even the soil humus disappears and every chance for natural reproduction is thwarted.

Effective fire protection, according to a recent investigation undertaken by our Federal Forest Service, is therefore not only the first necessary step, but actually comprises three-quarters of all that is

needed. Keep out the repeated fires, and without further aid three-fourths of such of our lands as at present produce very little timber or none at all, will within a reasonable period re-establish a timber



Every year forest fires destroy enough good timber to build a row of five-room frame houses spaced one hundred feet apart on both sides of a highway from New York to Chicago.

crop, not the most valuable crop perhaps, but one of real economic value. Start now, and sixty or seventy years hence when our virgin timber is exhausted, those waste acres will be producing at least

seventy-five per cent. of all the wood necessary to permanently supply our needs. No invective of forest fires could be stronger, no statement of the situation more definite.

Why do we have these fires? It is not a hard question to answer. Occasional conflagrations arise from lightning, but the real cause is the carelessness of man—the heedless smoker and the greenhorn camper. Then, too, our people have never quite outgrown the old conception of the forest as an obstacle in the path of civilization, an obstacle which must be destroyed to clear the land for good crops and cattle grazing. For all that has been said and written on the subject, there are stockmen and farmers who still hold this belief, and there are others, who, when burning the weeds and long grass on their own lands, care little whether the flames spread to adjoining woods. There are forest fire-bugs just like those who occasionally crop out in our cities and towns and set many a destructive blaze before the place becomes figuratively too hot for them; and there are enemies of the timber owners and the government who set fire to privately owned or public land merely out of spite or some feeling of injustice because rights which they have previously enjoyed have been terminated.

It is not easy to catch the careless camper who

destroys millions of dollars worth of property through failure to extinguish his glowing embers, and it is often even more difficult to catch the expert firebug. To run down and make an example of all such offenders would require the services of more than one Sherlock Holmes, but occasionally our own forest rangers have discovered in the ashes of a ruined forest so minute a clue as a burning-glass, set to kindle the fire when the responsible party was



What forest fires cost. The left hand pile of money represents the value of timber and property destroyed in the last five years by forest fires. The second pile represents the profits which might be made in a single year by various interests concerned in building and construction if the wood now consumed by forest fires could be saved and put into houses. The third pile represents what bankers and real estate men lose every year as the indirect result of forest fire destruction.

far away; and on that clue the guilty person has been convicted. The scouts and Indians of our childhood delight could recognize a moccasin print in the sand and follow the owner to his death. It may be less romantic to be able to trace the print of a patch on an automobile tire, but it has been done, and more of just such detective work is needed.

You cannot fight a forest fire like a fire in a city block. There is no chain of permanent roads and water hydrants to act as the goal of a flying fire engine. There is little anyone can do with a fire once under good headway, except perhaps to clear a protective strip by pick and shovel, or, taking fire's own weapons, to burn in advance of its path and confine it to hastily proscribed limits. Such an operation, moreover, requires not only efficient leadership and quick thinking, but an emergency force of hundreds of men.

Prevention is the cheapest form of cure. If a fire is discovered before it gains headway a comparatively small gang can often extinguish it by beating or by smothering with sand and earth. Forest protection, therefore, requires chiefly a highly organized system of continuous watching to observe the first tiny trace of smoke. For this purpose the United States Forest Service and several of our state forestry departments have developed a system of mountain observation posts or specially built watch towers where a guard or lookout is continually on duty. Aerial observation by planes equipped with wireless outfits or with parachutes for dropping messages has also been valuable, particularly as regards the more distant and less accessible regions where permanent posts have not as

yet been established. But although an airplane travels rapidly and covers great distances, it can sustain flight for only a few hours, and is therefore less effective than a permanent look-out. A few airplane manufacturers have attempted to develop



Aerial forest patrol is a valuable weapon against the forest fire demon.

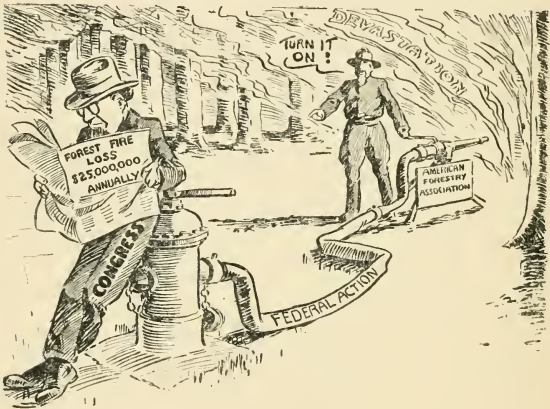
for use in fire fighting a special machine large enough to carry to the scene several men and their apparatus. Occasional tests have shown that these planes are useful in lake or water covered regions where good landing places are available, but many inland forests offer no such advantage.

"If everyone would protect his own lands, it would be a simple matter," you say, and so it would. But who is to require this and how? If I install a system of observation posts and fire fighting arrangements for my own property, and my neighbor does not, what is to prevent a fire from gaining headway on his lands and, in spite of all my efforts, overwhelming mine? Community fire protection long ago became the accepted duty of the local government, but since forests grow without relation to political boundaries, the responsibility must go higher.

The United States Government attempts to protect such forests as are under its direct control, and under a provision of the so-called Weeks Act of 1911, it also gives monetary aid in forest fire protection to those states which, through a promise to expend an equal amount of their own money show a willingness to cooperate. The law is a step in the right direction, but its successful operation depends upon annual appropriations from Congress, and these have been thoroughly inadequate to carry on the work. In 1921 the Federal Forest Service estimated the cost of adequate cooperation in fire protection as about \$8,000,000 but, realizing that economy was necessary, asked for an appropriation of only one million. Congress cut down that sum to

\$400,000—one-twentieth of the amount really needed.

Many of our states have seriously tried to cope with the forest fire problem, but it is not an easy one. Should all the people pay taxes to protect forests belonging to a few private individuals? How



The successful operation of federal forest protection depends upon appropriations from Congress, and these have been thoroughly inadequate to carry on the work.

far can a government go in forcing individuals to protect their own property, and how can the latter plan be enforced without an expensive system of supervision which in itself practically amounts to state protection? These are the questions to be

answered. Many of these objections are best overcome through voluntary cooperation between the government authorities and private owners or owners' associations. Each puts up part of the cost and the work is divided. In California, Washington and Oregon the lumbermen are subscribing annually from their own pockets close to a million dollars and handing over the money to government officials for fire protection work. In such eastern states as New York and Pennsylvania, where the very acuteness of a timber shortage has led to an appreciation of the paramount importance of protecting the few trees that remain, a similar spirit of cooperation has been manifest.

Prohibition is difficult to enforce because a considerable portion of the public does not want it. Only when the public wants forest fire protection will it be thoroughly effective. The best protective measures, therefore, will come not as complicated and unenforcible legislation imposed from above, but, originating in the small communities, will be passed on to the state, and from the state to the national government. The crux of the whole matter lies in education, in bringing the people to understand what the continuance of the country's lumber and wood supply means to each and everyone of them; in teaching the farmer the value of his own

wood crop, and in explaining to the city man that, because at least one-half of all the wood consumed is absolutely necessary to the production and delivery of the food which he eats, he too is vitally affected. Sweden has great timber resources, yet her fire losses are very small. There, every school teacher takes his pupils into the forest near the town and shows them how important the trees are, such lessons being considered as essential to the children's education as reading, writing and arithmetic.

A tobacco firm in Canada recently adopted the novel plan of making each package of cigarettes preach a sermon against carelessness. Neatly tucked away in the contents is a small slip on which these words are printed: "Please don't throw away a lighted cigarette. See that it is dead out. Lighted tobacco and matches are especially destructive in the forests. Living forests mean liberal employment; dead forests employ nobody. Don't be responsible for a dead forest." On our own side of the line the motion picture industry has recently enlisted in behalf of forest fire prevention. Its managers are now said to be planning a campaign throughout the country showing the destructiveness of forest fires, their effect upon the welfare of each and every individual and what each person can do

to help prevent them. If this plan is carried out, it will be one of the greatest contributions toward forest conservation ever made. In 1921 President Harding instituted by proclamation Forest Protection Week, a step which did much to awaken public interest. In nineteen states local proclamations were issued by the governors and a large amount of space was given by the daily press. Yet, in all, this effort is only a drop in the bucket, and soon forgotten.

There are millions of people in our country who know nothing of its timber resources other than that there is a lumber yard around the corner; they care less. The high prices and scarcity of building materials, paper, etc., is a mystery to them, and the fact that forests enter into the daily cost of living and form an essential part of the industrial prosperity of the nation means nothing. How to educate the people to the importance of all this is one of the biggest problems of today. Until forest protection is a matter of conversation at the office, in the club and in the home, there can be no definite assurance for the future.

CHAPTER XIV

THE GOVERNMENT LEADS

National and state owned forests in the United States; why this policy should be extended; the government and forest education.

Leadership in all matters so closely affecting the welfare of every citizen must naturally devolve upon some centralized authority, and indeed, as regards the maintenance of adequate supplies of forest products, many people feel that federal or state action offers the sole remedy: first, because the government, being a continuing entity, can alone afford to hold land long enough to await the second growth timber crop; and secondly, because lands thus held may be protected from fire without encountering the much mooted question of conflicting authority. At the very least our National Forests should be of sufficient size to prove a real factor in the future wood supply, and widely enough extended to establish for each district the most effective methods of promoting forest growth. Neverthe-

less, democratic government progresses no further in any given line than public opinion demands, and if its representatives as yet have no definite solution to offer, then we ourselves are chiefly to blame.

Many years ago all the land outside the thirteen original states belonged to the federal government.



The National Forests of the United States. The shaded areas represent forest lands now owned and controlled by the United States Department of Agriculture.

Timbered areas at that time possessed no more value than those unforested, and were in fact, for the purposes of permanent occupation, considerably less desirable than agricultural lands. If anyone could have foreseen the present situation our gov-

ernment might have taken some steps to classify land before making sales, and would probably have reserved much of the forest area. This was in fact the policy subsequently pursued in Canada, where the chief forests are still owned today by the provincial governments, and the sale of lumbering rights not only constitutes an important source of public income, but simplifies the whole problem of protection and conservation. The policy pursued in the United States, however, was in accord with the best understood theories of developing the country by allowing its citizens to avail themselves of the richness of her natural resources, and indeed private exploitation thus encouraged was undoubtedly responsible for the virile and rapid growth of the west.

It was not until about twenty years ago, when there remained in the public domain only a limited forest area, that there arose any wide agitation for protecting our natural resources, and the word "conservation" came into use. To be sure, the first National Forests were set apart in 1891 by withdrawing the land from sale, but this policy was not then understood and for the first twenty years constant efforts were made in Congress to do away with it. That feeling gradually passed away, and, as river navigation and water power development were much talked of, it was felt to be essential that the forests

on the watersheds of navigable rivers should be permanently controlled for the sake of flood prevention. The man who talked of saving the timber for the wood itself, however, obtained small credence and a limited audience. In 1911 Representative John W. Weeks, later Secretary of War, introduced and persuaded Congress to pass the law



TOTAL FORESTS OF THE UNITED STATES.



PUBLICLY OWNED FORESTS.

Only about seventeen per cent of the forest land of the United States is publicly owned.

which bears his name. Under it the United States government adopted the policy of cooperation in fire protection above mentioned and strengthened its policy of permanent forest ownership through a plan to buy some five million acres in the eastern states. In ten years something over two million acres have thus been purchased, and this property as a whole is now estimated as worth sixty per cent. more than it originally cost, while the sale of tim-

ber thereon, under methods which have constantly tended to increase rather than decrease the forest productivity, has yielded a substantial income. Nevertheless, the program has fallen far behind and today only about seventeen per cent. of the forest land of the United States is publicly owned. Moreover, since much of this area is at present commercially inaccessible and still other portions have only a thin forest cover, not over five per cent of the lumber on the market today comes from national or state forests.

Politics and false economy have been the greatest obstacles encountered. Congressmen still find it easier to vote many thousands for distribution of free garden seeds among their constituents than to give them back the forests which they need. The five million acres contemplated by the original plan were located in about ten different eastern states from Maine to Georgia, and these commonwealths, through the passage of legislation necessary to enable the federal government to purchase land within their boundaries, have already shown an eagerness to cooperate. There are now very considerable additional areas, both in the White Mountains and in the Appalachians, which have been approved by the government engineers, and, due to business depression, these lands have been

available for purchase at prices considerably below the established average. Although many of our national forest officials believe that it would be better to strain the public purse now, rather than to be obliged to pay double the price at a later date, Congress still hesitates. It is very interesting to note that a comprehensive forest growing policy adopted by England in 1919 almost ran on the rocks because of a similar desire to economize. In that particular case, however, the demand of the unemployed that the government should undertake public works resulted in an ultimate reversal of the decision, and a large part of a special appropriation was then devoted to forest growing. It all depends upon this one point; are we sufficiently anxious to ensure a future wood supply, to be willing to demand and pay for it?

When Congress does decide to continue its support of the Weeks Law policy and the money is forthcoming, two things should be done. First, the eastern program should be completed, and then the middle west and south certainly should receive attention. Some of our central states such as Iowa fortunately or unfortunately possess almost no poor land, and the yield from agricultural products is much higher than could be obtained from timber growing. Iowa, however, could get wood from

Minnesota and Wisconsin if the once extensive forests of those states could be re-established. It is probable also that the United States Government should acquire lands in Indiana, Illinois, Michigan, Kentucky and other states. The state of Michigan alone has today ten million acres of idle land, which in time could be brought into a state of effective productivity. Even with these additions, however, the government timber crop would still be very far from supplying all our needs.

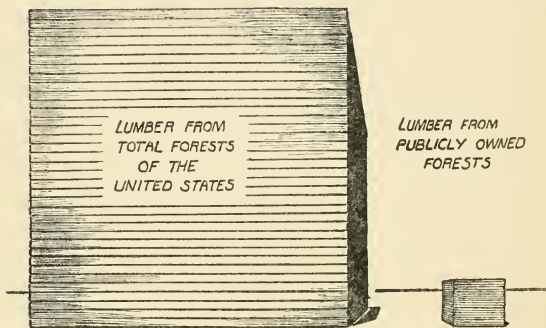
Under the American Constitution the authority of the national government to acquire land is not absolute. The Weeks Law was hung upon a provision authorizing the protection of navigable rivers. A fair and proper distribution of the national forests through the central states, however, would demand the purchase of land not strictly within watershed areas, and a search will have to be made to legally justify the necessary legislation upon some other grounds. The time has certainly arrived when the preservation of cheap building materials and the insurance of a future supply is quite as much in the public interest as is the maintenance of river navigation.

The example of the federal government in acquiring and operating forest land has been followed by a number of states. Pennsylvania and New York

undoubtedly lead, but New York state is handicapped by a constitutional provision which prevents the proper utilization of its great Adirondack Park. A very large portion of Pennsylvania, which was once heavily timbered, is unsuited for agriculture or for any purpose other than forest growing and is now largely a desolate waste. The last forest appropriation in that state called for two million eight hundred and seventy thousand dollars, one million of which was for forest fire protection alone. Pennsylvania has acquired title in its own right to over a million acres of land, but in sixteen years has succeeded in planting only about one-fiftieth of this amount, while lumbering of the remaining privately owned forests has progressed at a rate to more than counterbalance. The state nurseries, however, give away several million seedlings every year for planting by private owners, boy scouts and other organizations, and numerous private plantations have resulted.

The methods of forest ownership and control vary widely in the different states. In North Carolina, for instance, forestry work is under the direction of the state geological and economic survey, the state forester being a sub-official thereof. That state has undertaken an official survey of its remaining timber resources with a view to establish-

ing a plan for future action. Having still a considerable area of good forest, the problem is there largely one of keeping out the fire and allowing the pine and other woods to naturally reforest themselves. Although New Hampshire and Vermont are generally recognized as timber producing



Not over five per cent of the lumber on the market today comes from national or state forests.

states, it is a less generally appreciated fact that over one-half the area of Massachusetts and Connecticut is also more suitable for growing timber than for any other crop. Yet today the railroad trains in all the New England states are running over ties brought from the Pacific Coast, and every wood-user is paying about twice as much

as he would if the timber were grown at home. The State of Massachusetts owns about thirty-five thousand acres of forest and has recently adopted a plan of buying and planting a total of one hundred thousand acres of state forest. The significant fact is that this act grew out of an "Initiative" proposal signed by 31,000 registered voters. Massachusetts also spends a fair sum of money for fire protection and, further, in common with Pennsylvania, New York, Connecticut and other commonwealths, attempts to encourage reforestation by private owners through a plan for reduced taxation on lands set aside for the production of a new wood crop.

New Jersey obtains a result just as effective as under state ownership, through a plan for state care and scientific operation of some privately owned forest land. This state has also put into effect a law which requires the teaching of forest fire prevention in the public schools. Tennessee, California, Rhode Island, and West Virginia have recently followed suit.

The middle western states have been slower to grasp the situation, but are now also beginning to show interest. The State of Wisconsin now owns about 300,000 acres of forest land, is protecting it from fire and doing some planting. Illinois has

been making a careful soil survey covering more than two-thirds of the counties in the state, and that survey indicates that five or six million acres, being unsuitable for agriculture, will have to be used for tree growing or allowed to lie idle. It is probable that some real forest program will soon be presented to the state legislature. Indiana is in a similar condition, and has already acquired a little over three thousand acres in the southern portion of the state, where an experimental station has been established. Even as far west as the Pacific Coast, where virgin timber is still abundant, the movement has been felt and the State of Washington has already formed the nucleus for a public forest.

Whole volumes might be written upon the gradual development of state policies along this line. There is no particular advantage to be claimed for state forest ownership over federal ownership or vice-versa, such efficiency and consistency of purpose as has hitherto been shown by the federal government being offset in a measure by the fact that state action usually engenders greater local interest and a better spirit of cooperation among the people. Just as the centralization of authority in Congress versus states rights has been an unending struggle since the American constitution was

first framed, there are and probably always will be protagonists of either system.

Whether it be federal government or state, however, this problem comes so close to every man, woman and child in the country that some sort of public leadership is absolutely essential. We may not have been originally successful in government management of large business affairs, but we do at least look to the government for an example in matters of overwhelming public interest, and we do demand that it shall direct education along the necessary lines.

CHAPTER XV

WOOD LOTS AND WOOD CROPS

The farmer's wood-lot as a key to the situation; extent of such wood-lots and their possible producing capacity; trees rightly regarded as an agricultural crop.

The government must lead, yes, but who will follow? It is now evident that wood is not a raw material like iron ore and oil, but a growing crop similar, except in the time that it takes to reach maturity, to any agricultural product. Among the well known foresters of the country not one has as yet practised his own preachings, gone in for raising timber and made money. The farmer does not call himself a forester but it is chiefly he who has profited by what forestry tries to teach, and if there is one place where we may look for practical proof of profitable wood growing it is in our progressive agricultural regions.

This is especially true in the east where the market is near at hand and almost the only competition comes from Pacific Coast lumber with its

heavy transportation costs. The United States Forest Service tells the story of one farmer in New Hampshire who owned a strip of practically worthless sidehill. Forty-five years ago he set out fourteen hundred pine seedlings obtained from a nearby thicket. The three acres thus planted were recently sold to a lumber company for something over \$1,000. Assuming an ordinary land value of five dollars an acre, and a charge for taxes and oversight for the period averaging two dollars per acre a year, the operation has yielded a return of five per cent. on the total investment in land, labor and annual outlay, and in addition a sum equivalent to a yearly net profit from the start of over five dollars per acre.

No one better than the farmer understands the necessity of making the soil produce the maximum of income. There are comparatively few farms, however, where all the soil is suitable for food crops. American pioneers had no soil survey and no handbook of land economics to tell them that a farm cleared from the woods back on the hill would not give them a living; but occasionally some men went in and cut down the trees, tried to make a living and failed. Then, when several generations later the forest cover again grew up, the land began for the first time to pay. Fortunately, however,

most of the rocky and unpromising places were untouched, and it is these which constitute the large majority of the farm wood-lots of today.

There are thousands of just such wood-lots in every section of the country, but it has only been within recent years that anyone has taken the



The aggregate of all the farmers' wood-lots in the country was in 1915 no less than two hundred million acres. This represents an area as large as the whole of the New England states, New York, New Jersey, Pennsylvania, Ohio, Indiana and Illinois.

trouble to consider them. The Forest Service now tells us that sixty per cent. of all the forests in the country will soon belong, not to the government, nor to the states, nor to the lumbermen, but to the agricultural element in our population. In 1915 the aggregate of such holdings was no less than two hundred million acres, or something over three

hundred thousand square miles. This is equivalent to an area of continuous forest as large as the whole of the New England states, New York, New Jersey, Pennsylvania, Ohio, Indiana and Illinois. In the south there are still large areas of so-called farm wood-lots growing on good soil which will eventually be diverted to food growing, but on the other hand statistics for the New England States show that every year several thousand acres, which are no longer sufficiently productive for general farming purposes, are reverting to forests and being more profitably worked for the wood crop than previously for food. There one may find today men who make more money out of the annual wood crop than they do out of the rest of the farm, and still others who just manage to break even on dairying or food raising but make their real livelihood from the sale of wood. American farm wood-lots are today far from reaching a maximum of productivity, as only here and there has mere chance taught the profitability of effective forest cultivation, but it is no dreamer's theory to estimate that, without in one whit impairing their forest capital, the farmers of the country could supply every year approximately one-fifth of all our wood needs!

The forest crop, like any other, has its seasons of sowing, cultivating and harvest, but those seasons

may come together and, generally speaking, any of the work can be carried on in spare time; indeed, the exploitation of a wood-lot can often best be conducted in winter when the farmer has no other work for his teams or for himself and his hired



In the New England States we find today men who make more money out of the annual wood crop than they do out of the rest of the farm.

help. When, therefore, he has learned that even the poor wood-lot can supply him with winter fuel and a little profit besides, he often thinks of extending it. There are several ways to begin. Some species of trees may be propagated by the sowing of seed directly on the land in little holes or

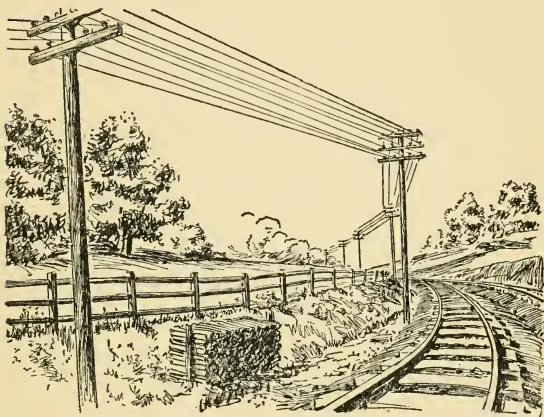
roughly ploughed furrows. For others, the seed has to be sown in nursery beds and the resultant young plants later set out, while for others again, such as willows and poplar, young green cutting are simply thrust into the ground and left to grow. The reading of some forest primers would seem to indicate that these were complicated processes, but to the farmers they are merely the adaptation of ordinary agricultural methods. Grain is sown, tomatoes, onions and the like are set out in the form of little seedlings previously started in a hot bed, and other plants, such as berries, are propagated from green shoots. For the past few years prudent grangers in Vermont have been setting out an average of four or five hundred thousand forest seedlings each spring, and reports show that at least eighty per cent. of these youngsters are developing into sturdy trees.

After the wood-lot is once started cultivation may be naturally regulated by the density of the leaf canopy, thus keeping down the weeds and permitting the formation of humus from rotting leaves, twigs and branches. Under such a plan the forest will ordinarily reproduce itself indefinitely. If weeds are particularly persistent, as is often the case in the open form of growth required for developing large crowns on sugar maples, limited grazing of

cattle is helpful, but during the early stages the entry of any animals which may feed upon the young seedlings or trample them down must be prevented. Where the soil is very hard, however, the re-establishment of a forest often requires a tilling of the soil similar to that necessary for any other crop. On the shores of the Chesapeake some potato raisers turn this to their own advantage. The farmer selects a location where pines have been growing, carefully plows under the needles and litter as a fertilizer, and from this soil obtains several crops of sweet potatoes. He then seeds the land to pines once more, and after a time repeats the process. In Germany an alternate rotation of vegetable and wood crops is very common.

The idea of operating a wood-lot or a larger forest upon the crop theory depends solely upon regarding the existing forest as capital and the wood production derived therefrom as an interest or gross return. The only way to increase the yield of such a forest is to increase the capital or change it to a different species. It is not always easy to determine how to regulate the cutting so as not to impair the capital or undercut the yield, but the elementary idea is simple. Supposing a tree will reach the desired size in forty years, if a farmer plants one acre of land every year, after the fortieth

planting he will be able to cut one acre every year and just keep the balance even. In Germany such a method is often carried out in exact detail, but in this country, where the ages of the trees on a given



Telegraph poles, fence posts, railway ties and cord wood represent a few of the products of the farm wood-lot.

tract of land are usually not so evenly balanced to begin with, it becomes a matter of estimating the rate of growth. Simple methods have been devised whereby the volume of wood on a given tract can be readily figured from time to time as a check upon the operations, and most successful wood-lots have

been maintained at about an average stand without a great deal of trouble.

The first purpose of a wood-lot is to supply cord-wood and timber for the individual use of the owner. It has sometimes been said that if one-eighth of the average farm is in timber, the wood crop will just about take care of home needs. Actual profit then depends upon an additional production, and the far-sighted operator endeavors to grow trees of such kinds and sizes as will best accommodate the market. It is usually advisable to develop some special line. For instance, ash brings its maximum income when sold for tool handles, oak for furniture and quarter sawing, tulip poplar for veneers, black cherry for furniture, etc. The growing of fence-posts and poles has been particularly profitable as the saving of high transportation costs permits a good local market everywhere. Poles run from twenty to sixty feet in length and upwards, the smallest top diameter usually being in the neighborhood of seven inches, while fence-posts are ordinarily about seven feet long. Near a city or town cord-wood often brings good prices, and, when sold as pulpwood, spruce, balsam and some of the southern pines are generally remunerative. In northern New England, New York, Mississippi and Louisiana many farmers are able to make consider-

able profit from this source. Experience has shown that hemlock sold for tanning purposes often brings more money than as lumber, while in limited areas beech, birch and maple may be sold for distillation and charcoal making. Willows for basketry may be grown in one or two years after setting out the shoots. As the uses of wood are so varied the list of products above mentioned by no means covers the field.

Trees are useful on the farm as wind-breaks for orchards and other plantations. In the south and particularly in tropical regions they are scattered through the fields to protect the crops from the mid-day sun. Farmers are also beginning to appreciate the importance of the forests because the wood-using industries tend to maintain the local population. It was partly with this end in view that the Farmers' Federation of the State of Indiana recently took a definite stand in favor of providing a means for the revival of the once famous hardwood forests for which that state was noted. Through government cooperation many of the middle western states have already come to enjoy good roads, and those who have seen the benefits thus obtained, are anxious to extend the federal aid plan to include forest re-establishment.

Economically this interest in wood as a crop is

one of the most promising developments of recent years. As the country grows larger and the interchange of all goods becomes more complicated, local production and local marketing to reduce the high cost of living assume greater and greater importance. In fine, the farm wood crop idea represents in America our nearest approach to a permanent forest and is the fundamental theory behind all the suggested methods to insure the wood supply of the future. Change only the form of ownership and the farm wood-crop becomes the municipal wood-crop, the town wood-crop, the state wood-crop, and the foundation of all our vast timber using industries.

CHAPTER XVI

TOWN FORESTS

Town and city owned wood-lots in America;
essentials necessary to general adoption of the plan;
forests and unemployment.

If the sum total of countless little wood-lots on farms is a potentially important factor in its ability to solve the shortage of wood and lumber, why not carry the idea a little further? If a wood-lot is valuable to the farmer in supplying his home needs, why is it not doubly valuable to a settled community where there is an opportunity to use almost every product? Towns and cities have already successfully engaged in the business of furnishing water, gas, electric light and transportation. In Europe municipalities also control their own wood supply, and the Chamber of Commerce or local Trade Board uses as an attraction for all sorts of industries the fact that a guaranteed supply of wood products can be offered. Thousands of cities, towns and villages throughout the United States already

possess vacant land, school property, poor farms or watershed reserves, which could be put to work producing timber just as easily as it is done across the ocean. If it will benefit the community to have wood-working industries, is it not better and surer



The Town Forest movement is already gaining headway in America. Its object is to furnish wood products free of transportation charges

to offer raw material which the community itself can control?

The town forest movement is already gaining headway in America. One of our most progressive states along this line is Massachusetts, which has

gone so far as to enact special legislation covering not only the utilization of such public lands as may already belong to the community, but also the legalized acquisition of additional areas. The constitutional justification is clear. When any real need cannot be fully supplied by private initiative, it becomes a public duty to perform the service. If an adequate city water supply cannot be properly furnished by private individuals, it must be provided by the public, even at a financial loss on the operation. The wood supply offers no different problem. Nation and state may do their part, but the community takes pride in its ability to look after itself, and it will always do so.

The city of Fitchburg, Massachusetts, claims the first officially established town forest in the United States. During 1914 it purchased a number of small wood-lots partially scattered, aggregating in all about one hundred acres, the scattering of the lots being in no way a disadvantage as the fire risk is accordingly decreased. Part of the land already has a fairly good second growth of pine, and the remainder is being rapidly planted. Other Massachusetts towns which own forests are Walpole and Petersham, while Brookline also uses its three hundred and fifty acres of watershed for timber production. Walpole acquired its lands by gift, and

then set to work to plant pine seedlings by means of Arbor Day celebrations in the public schools. The Petersham forest was the outgrowth of a two hundred acre poor farm whose inmates gradually decreased to the point where the farm was no longer



Thousands of cities, towns and villages throughout the United States already possess vacant land, poor farms, school property or watershed reserves which could be put to work producing timber.

worth continuing in the original capacity. The trees here are already well advanced in age, as, in the years that the poor farm was neglected, the pine came up of its own accord and part of the forest had reached maturity about the time that attention

began to be called to it. The State Forestry Association points to the fact that at least ninety other towns in Massachusetts own poor farms, each with an average of eighty to ninety acres of forest land which could be profitably operated by the community.

Massachusetts, however, is not alone in promulgating the town forest idea, and New York State now has a large number of cities and villages owning forest land, often with several hundred acres of young forest established by the planting of trees. The beginning of these forests dates back to 1908 when the New York State Forestry Department began to sell reforesting stock, but it is only within the last few years that general interest has been manifested in the work. Over seventy New York cities and villages are now carrying on operations of this kind. Among the more noteworthy may be mentioned the city of Gloversville with about four hundred acres of reforested land, Rochester with an equal area, Glens Falls with six hundred acres, and the City of New York with over two thousand acres. While these forests have been established primarily for the protection of the water supply of the various municipalities, it is evident that the future wood yield will place them on a similar basis with the municipal and communal forests of

Europe. Malone, New York, and numerous other towns have established municipal forests quite aside from watershed maintenance.

The latest innovation in the idea of a community forest consists of a so-called forestry company. In such a corporation anyone is allowed to purchase stock, and the funds are used for the purchase and planting of abandoned farm lands. The first company of this kind to be organized in New York is the Otsego Forestry Company, located at Coopers-town. During the past two years it has planted about two hundred acres and now owns a total of six hundred acres suitable for reforestation. A similar organization has been perfected by the Conservation Club of Oneonta, New York, which has purchased about three hundred acres of land to be maintained as a game refuge as well as for the purpose of creating a new forest. The Fish and Game Club of Bainbridge, New York, has undertaken the reforestation of a tract of forty acres presented to the Club, and, as the conditions which accompany this gift of land provide that if at any time the club may cease to exist the land and forests shall go to the town of Bainbridge, this project may also result in the establishment of a strictly town forest.

These represent a few noteworthy eastern exam-

ples, but the movement has more recently extended to the middle-western states, Ohio having now two city forests, one owned by Cincinnati and one by Oberlin. State legislation has made it possible for other Ohio cities to follow this example and they are continually being urged to do so.

A town forest is handled in somewhat the following way. If there are already trees of useful species growing on the land, a little immediate thinning will probably tend to encourage their growth, and the trees taken out may be sold for fuel, fence-posts, poles, wood-turning, or some similar purpose, the income thus derived being dependent upon the extent of mature or semi-mature trees available. In the meantime, a vacant or semi-treeless area is planted with seedlings of such species as are best adapted to the region. Pine is often planted in Massachusetts because the white pine is the native soft-wood tree of that state, and has a wide utility. In the middle-west, however, hardwoods, although slower growing, are often found more suitable. The selection of species is a matter upon which the community should take the advice of some experienced authority, such as the Forest Board of its own state or the United States Forest Service. States with a forestry department of their own can often supply supervision without charge. The ulti-

mate development to be anticipated comprises the joint employment of a specially trained forester by neighboring towns and communities.

A single town can hardly afford to start its own nursery for raising the two or three year old seed-



In Europe the town forest plan goes far toward a solution of the unemployment problem. Could we not also adopt this remedy?

lings to be ultimately set out, but such states as have made provision for official recognition of the town forest system are establishing extensive public nurseries and usually give away seedlings free of charge. In Massachusetts, moreover, the state for-

estry association offered to plant free of charge five thousand trees, or approximately five acres, for any city or town which would legally establish a forest of one hundred acres or more during the calendar year 1922. Planting may usually be carried on at a cost per acre of from five dollars upwards, depending upon the cheapness of labor available.

Once properly set out the seedlings will grow for any desired period with little attention other than fire protection and occasional cooperation with the state or federal government for the suppression of blights and insect pests, but generally speaking, the community will select trees of such species as are least susceptible to damage from this source. Although no forest started by tree planting can yield immediate returns, municipal ownership offers the advantage of tax exemption or partial assessment during the period of waiting. In the meantime, too, the community gains through gradual beautification of the land and protection from soil erosion during heavy rains.

The age of maturity varies for different species. Some of the pines begin to yield commercially valuable lumber in twenty-five to thirty years, while pulpwood may be obtained in the south a little earlier. Except for thinnings made to promote good growth the hardwood forests of Europe are

often left for over a century. As different sections of the forest reach the desired age the exploitation begins. Wood may be sold as it stands upon the stump, or the town may itself carry on the logging operations and dispose of the product. A considerable amount of pine on the Petersham poor farm already mentioned was sold to a lumberman who took out the trees and disposed of the waste according to prescribed methods. It is an advantage, however, to have the forest more or less uneven in age, as if it is not all cut at the same time, the bared spots will re-seed themselves from the surrounding trees.

The success of the town forest idea in America depends upon a wide extension of the plan. To obtain the maximum profit a well developed market for thinnings and by-products is essential, and one single isolated community can never succeed as well as it could if its neighbors followed the same policy. If the farmers between the towns meanwhile care for and develop their wood-lots, so much the better for all concerned. On the other hand, it is a fallacy for any community to wait for its neighbor to start. The first good lumber harvested in a region where tree-growing is little practised, will sell in competition only with lumber coming from the far away Pacific Coast—lumber which bears a freight charge

in excess of its original value—and the return is sure.

There is a final feature of the town forest movement which in itself goes far to justify the plan. The Black Forest of Germany, the Vosges district of France and parts of Switzerland, are the great communal forest regions of the world. Although these are manufacturing sections subject to all the ups and down of industry, the town forests so effectively absorb the surplus labor that unemployment is practically unknown. When industrial conditions are poor planting and thinning are pushed, and roads to increase the accessibility of certain wooded sections are built. When labor is scarce the forest can wait. Here in America periodical epidemics of unemployment form one of our most serious national problems. Could we not also find a remedy in the town forest plan?

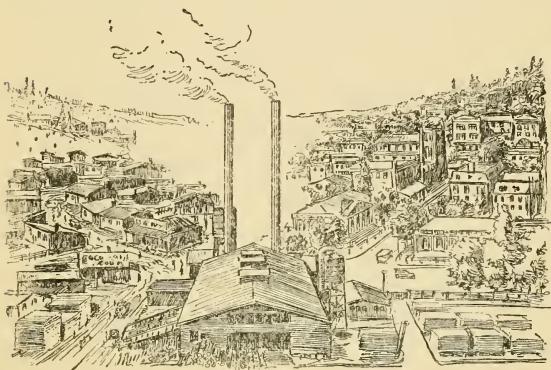
CHAPTER XVII

REFORESTATION TO PAY DIVIDENDS

The new attitude of the lumber industry; the experience of one of the largest lumber companies in the United States which is basing its future policy upon reforesting its own land.

It is evident that if our forests are allowed to disappear, all kinds of industries from paper manufacturing to shoe making will fail, and even the production of food will be difficult. Yet it is the lumberman himself who will suffer first. What is he doing about it? As in nearly every other industry, much of the lumber business has been handed down from father to son for generations. On the Pacific Coast today you meet the sons and grandsons of the men who built the first sawmills in Massachusetts. When the forests were cut in New York, in Pennsylvania and in Michigan, these men left their shanties and their dismantled mills and bought new timber further west. Now they can go no further. It is difficult to convince a man who stands in the middle of a virgin forest which will

supply his mill for years to come, that it will all some day be gone. There are, however, many lumbermen who can already foresee that the end will come, not merely for their children, but during their own lives. Some of us are tempted to say:



The old type of lumber town and the new. To the left of the sawmill shown in the composite picture above may be seen the temporary shacks of an industry intending to deforest the land and then move on. To the right may be seen the lumber town of today, relying for its permanence upon a policy of continued reforestation.

“Well, you brought it on yourselves by devastating the forest,” and the lumbermen answer “No, you demanded cheap lumber and we gave it to you, competing with each other to turn out the most for the least money. You are responsible.” Why argue the point? The fact remains, and today no one is

more interested in finding a way out of the difficulty than the men who depend for their livelihood upon the production of wood.

The first lumbermen who have seriously taken up the idea of growing timber to maintain their industry have been those fortunate enough to be still located near the principal markets. The freight saving helps foot the bill. There are exceptions and short-sighted individuals everywhere, but it is already the general rule in the east that lumbermen no longer cut entirely by the wasteful methods formerly necessary under strenuous competition. Even where no regulations exist, they are trying to protect the young growth or to leave seed trees; and, where they sell in the same market with lumber upon which freight must be paid from the Pacific Coast, many can and do set aside a fund for re-planting. Were it not for the fire hazard, for the fact that a few hours of forest fire are sufficient to completely destroy the accumulated investment of years, there would be much more work of this kind. What is the use of setting aside money to plant seedlings if there is more than an even chance of their being burned up before they reach maturity? Lumbermen are accordingly behind every movement for state and national cooperation in fire protection, every movement for the farmer's wood crop,

for National forest extension, for the town forest, and for public education in the importance of the whole problem. When the public recognizes the value of reforestation it can be practised with success and certainty; before that, only with the aid of good luck.

Thank Heaven, however, there are a few large lumber manufacturers who are willing to take the chance and who, through their endeavors, are assisting in the educational process. One of the largest manufacturers of wood products in this country announces that it has now permanently established itself in Louisiana and will follow this new trend to its logical conclusion. It will never again cut the last of its timber and pull up stakes in the old way to follow the ever-receding forest because its own supply is to be made inexhaustible. In common with most other lumber manufacturers, this company once looked askance on the idea of reforestation. Its hope was to build up, coincidentally with the lumber industry, a great agricultural center based on the cut-over lands, which, when the mill had finished its work, was to give profitable occupation to all comers. After several years of experimenting, however, it was evident that the returns from this plan were hardly sufficient to form the basis of industrial permanency.

It was then that the natural regrowth of certain cut-over sections where fire had been kept out, began to direct attention to the idea of reforestation, and the new policy was the result. Instead of the usual group of ugly, unpainted shacks, this company has built a handsome town, each building a model of its kind. Parks, schools, offices, hospital, hotel and homes are hardly to be equalled in any city of a hundred thousand people. It all represents faith in just one idea, that sane and practical reforestation can be made to pay dividends.

The problem of growing timber is perhaps more simple in the south than in certain other parts of the country. Given a chance, Nature generously attends to the re-seeding, and the Loblolly or Old Field pine, indigenous to that section, is one of the most rapid growing of all species. Although taking about five times as long to reach maturity, the Longleaf pine, which for many years has been the standard wood for construction purposes throughout most of the United States, also reproduces freely.

The chief obstacle has been fire. In this well-settled community the careless match has been responsible for the destruction of many millions of seedlings every year. Some who profess to understand the principles of forestry have claimed that a

burning over of the land to remove debris immediately after the timber is cut is one of the best means of promoting reforestation. A single fire often does result favorably in the Douglas fir country, but for the pine of the south this is emphatically untrue, and although a few seedlings may survive the first burning, the majority are destroyed. The dangerous season in southern Louisiana is during the winter months, for there is no snowfall, and as soon as the first frost nips the long grass which everywhere covers the forest floor, it becomes a most inflammable tinder ready to flare up at the slightest spark. Plowed fire lanes, dividing the tracts into the smallest possible units within a reasonable limit of expense have been used with success, and this company is to supplement the fire lanes with watch towers where a man will be continually on duty.

The present town site of Bogalusa, Louisiana, was entirely cut over about fifteen years ago. Where repeated grass fires have burned through there is practically no reproduction, but in many naturally protected places a splendid second growth of Loblolly may be observed. For one such group the Forestry Department has carefully counted, measured, and numbered every tree, and keeps a record of annual growth as a check for its own estimates. During 1920, a few of these trees were

cut and manufactured into paper pulp as a proof of the practicability of the reforestation idea. Doubtless it would have paid better to have left them four or five years longer, but in this case the company merely desired to illustrate its contention.

Many natives of the Longleaf pine country claim that an area timbered with Longleaf will not come



Fattening at the expense of the young forest.

up a second time to the same species, but only to the Shortleaf varieties. The Louisiana State Forestry Department some time ago demonstrated the falsity of this theory and explained the reason. Every settler in that country, be he white or black, keeps a varying number of hogs. The chances are he himself does not know how many, for the state is with-

out a stock law, and stock of every kind is allowed to range about through the unfenced woods and cut over lands. The Longleaf seedling devotes the first year or so of its life chiefly to growing roots, and the long tap-root with its heavy sugar content is a favorite tit-bit for range hogs. In order to eat the sweet root a few hungry razor-backs will pretty effectually kill the one or two year old Longleaf stand on a tremendous acreage, but they will not harm Shortleaf seedlings. The company has carefully fenced nearly five thousand acres of land upon most of which the 1920 seed-fall is growing, this being the first large scale work of the kind ever attempted in the country. Fencing is an expensive operation, but the company has been willing to experiment along this line because of its faith in the potential value of the investment.

In spite of these protective measures it is realized that no new development can successfully take place until a large majority of the people are educated to appreciate its value. The company's department of forestry has made it a principal part of its work to conduct a thorough and continuous publicity for the education of the local population as to the importance and value of a permanent wood supply. This has been carried on in an excellent common sense way—not only through the local papers,

through posted signs and special appeals, but also through interesting exhibits of forest products at the country fairs. Experience shows that visitors crowd to these forestry booths, if only to search for their friends among the photographs of farmers who have already taken steps to plant or conserve the young timber growth on their land, but they see the other exhibits too. It is possible that much of the success which will attend this educational work will be due to the special efforts of the Chief Forester, for he himself was born and bred not far from the present town, and the personal equation is always important in obtaining good will.

Where it appears that, due to the interference of man's agency, the cut-over land has not been properly re-seeded, the company has experimented with various methods of sowing. The best way has not yet been determined. On two thousand acres of land Longleaf pine seed was broadcasted in the fall, but without satisfactory results. About a pound was scattered over each acre; but Nature's own methods are more lavish than man can afford, and it is probable that, as the seed was scattered at a time when other food for the birds was scarce, the feathered flock which followed the sowers probably profited most by the operation. On the other hand, eight hundred acres of fenced land were roughly

plowed, and then about half a pound per acre of Longleaf, Loblolly and Slash pine seed were drilled into the soil. The results here are already evident, and the ground is well covered with fine little seedling trees of these species. Fair results have also been obtained where several thousand Loblolly seedlings found in the woods under the mature trees were transplanted. These seedlings could not have lived under the shade of the dense tops, but about fifty per cent. are now doing well on a cut-over area. When it is considered that fifty mature trees to an acre here constitute a fair stand, it is evident that, even if a high percentage of the seedlings is lost, the experiment will still have proved successful. It is interesting to note that after advertising to buy pine seed at one to two dollars a pound without success, the company was subsequently able to collect its own seed from the heavy 1920 crop at a cost as low as fifty cents a pound.

It should be kept in mind that all these methods of artificial reforestation have been purely experimental, and the most practical ideas will be gradually evolved. The keynote of the whole plan is not to assist Nature, but so far as possible to remove the obstacles which man has placed in her way. The Forestry Department operates well ahead of the logging crews, plowing out its fire

lines, and watching to protect the millions of tiny seedlings in the soil. When the logging crews begin work, to be sure, more than half of these tiny seedlings will be destroyed by the skidding of the logs, etc., but enough will probably be left to establish a crop. In case these seedlings already in the soil should not be sufficient, the forester also selects groups of young healthy seed trees which he marks with a painted circle. These the logging foreman must protect from all bruising and injury. The seed tree idea is everywhere in its infancy, and most attempts along this line have frankly failed because the forest tree is a community dweller. When left alone by the cutting of its neighbors it usually has a short life, blown down by the first strong wind, or succumbing to the attack of some insect which has multiplied in the dead brush left behind by the loggers. From leaving single selected seed trees the company obtained poor results, but the group idea is a comparatively new one and only the next year or two can testify as to its effectiveness.

The most expert advice from both state and national sources has been obtained in the formulation of the whole reforestation policy. As an example of thorough-going faith in the idea the company is now paying for an exhaustive soil analysis and survey of its land holdings, to determine just what por-

tions are more chiefly suitable for agriculture, and what can best be reforested. The results of the earlier reforestation experiments will then be applied to many thousands of additional acres so selected, and a really perpetual timber supply will be obtained. The regrowth of the town site has already demonstrated the practicability of this as far as the Shortleaf species go; but the plan looks ahead even as far as forty or fifty years when the first replanted Longleaf pine will reach a merchantable size—a plan so far reaching and revolutionary that it may in time succeed in changing the entire character of the lumber industry. It certainly seems worth a try. This company is one of several which have been the pioneers of the United States in large scale reforestation and thoroughgoing conservation methods. They have built for permanence through faith in that experiment. When that faith is justified and practical reforestation actually begins to pay dividends, we may cease to fear the exhaustion of our timber resources.

CHAPTER XVIII

PHILANTHROPY OR EFFICIENCY

How the pulp and paper industry regards reforestation.

If forest re-establishment is necessary for the maintenance of the lumber industry, it is doubly so for the continued production of pulp and paper. Paper manufacturers cannot pull up a two million dollar plant with all its expensive and heavy paper-making machinery to move elsewhere, as the saw-mill men have done. Forest growing with them has passed the stage of ineffectual philanthropic efforts. They must make their wood supply last or go out of business, and the whole industry cries for an efficient management of the woodgrowing problem.

Certain methods of conservative cutting and of planting forest trees have been undertaken by a number of pulpwood forest owners, particularly in the east; but these developments have not yet reached an extent sufficient to have an important effect upon the prospective wood supply, and they

are significant chiefly as showing the present trend in the management of privately owned timber lands. One of the largest and best known companies, which draws upon timber in northern New York State, has been making a thorough and comprehensive survey of all its holdings with a view to establishing such methods as will tend to make the material last, while further south in the Allegheny mountain region another prominent concern is holding about 134,000 acres of cut-over land for a second timber crop. Through various experiments the pulp and paper industry has done much to establish an index of forest planting costs, and a very complete report on this subject covering various sections of the United States from Maine to Minnesota, and extending into Ontario and Quebec, has recently been prepared. Because many of the large Canadian pulp plants have been operated by American citizens in their search for hitherto untouched forest resources, relations with Canadian paper manufacturers are very close. They indicate that on the whole, eastern Canada is somewhat ahead of us in dealing with the problem, and indeed, the mutual fire protection associations of Quebec and the scheme of government cooperation and education there in effect, form a model which we may do well to follow.

Pulp and paper men in all sections of the country are fighting for the education of the public and for control of the fire hazard as no other group has hitherto done. Not only have they taken the risk in experimental planting, but in combination with other wood producers, with the United States Gov-



Pulpwood growing has passed the stage of ineffectual philanthropic effort. The wood supply must be made to last or the whole paper industry will fail.

ernment, with state officials, and with the American Forestry Association, have become prime movers in the present efforts to bring about a national forest policy. It might have been well had they possessed the foresight to start this work a generation or so earlier, but men who can successfully and profitably

carry on their own business and at the same time plan for future generations, are rare. If the wood-using industries have at last waked up and squarely confronted the general peril, the rest of us, subject to the same handicaps of human nature, had far better enter into whole hearted cooperation rather than sit back and indulge in carping criticisms.

This does not mean, however, that the entire industry has definitely adopted the practice of conservative cutting and forest planting on the European plan. The desirability, the ultimate necessity, is evident; but it is clearly cheaper to cut every tree on a given area once and for all, according to the present methods, than to periodically re-visit the same ground and select single specimens or patches in order to promote natural regeneration. Roads, railways, camps and machinery may be abandoned or moved elsewhere at a less cost than is required to maintain them for such occasional use. Artificial planting, on the other hand, equally necessitates new and increased expense. What the pulp and paper manufacturers are doing, therefore, is chiefly in the line of finding out how this increased cost may be met.

Practically speaking, forest management should be the efficiency engineering of the wood-using industries. We must get away from the habit of

mind that the lumberman is the forester's enemy, and vice-versa. As the Irishman would say, the lumberman should be a forester first and the forester should be a lumberman first. A combination of the two, a man who has had real experience in both fields, may be rightly called a forest engineer, and it is his type that is gradually helping to solve the problem.

In parts of eastern Canada, Maine, New Hampshire and New York, pulpwood is brought to the mills by much the same methods of winter cutting and spring driving of the rivers as were made famous in Stewart Edward White's stories of the old Michigan days. The company itself operates a certain number of camps under its direct management and control, but often a considerable quantity of the timber is "contracted." While it was generally realized that the contract system resulted in only the best timber being taken and the remainder being left in scattered bunches which would not permit of a second cut except at prohibitive cost, it has remained for the new type of forest engineer to demonstrate the really awful and destructive waste therefrom. It is the forest engineer too, who has now produced figures to show that pre-planning and careful preliminary reconnaissance and mapping, even at considerable expense, will not only extend

the life of the operation, but also bring logs to the mill at a less cost per cord. Real cost systems have been little applied to woods operations, but some forest engineers hope to demonstrate that this study will prove quite as valuable to a large scale logging operation as to a cash register or automobile manufacturer.

While old school logging bosses used to laugh at forestry ideas, it is now the Forestry Department, made up of a personnel of forest engineers, which tends to become the planning and control department of the woods operations. At the beginning of the season a conference of officials is held, and the chief forester is informed how many cords of wood will be required for the coming year and what species may be used. With the aid of complete surveys, some of them made perhaps with the aid of aerial photography, the forestry department then selects the areas to be cut, locates the camp sites and sends experienced men to blaze out the necessary roads. Then, after the cutting begins, a regular inspection is carried on to see that company camps and contractors alike abide by the directions given. Progress reports, hitherto almost unknown in the logging industry, keep the mill management informed as to the expectancy of raw material, while a separate branch of the department carries

on special surveys for bridge or dam sites, makes time-studies of operations to determine fuel and labor costs per unit of production, and conducts experiments with new equipment. Fire protection is not forgotten, as the closer touch between forester and woods operations alone makes it more easy of attainment, but the greatest advantage to the owners comes through the fact that the life of their operation is extended, and every new economy introduced means just so much saving which may be devoted to tree growing.

This plan, however, is no panacea. The fact that a few lumber or pulp concerns may find it possible to carry on a certain degree of reforestation, even under existing conditions, does not alone guarantee a perpetual and all sufficient supply of wood products. Each logger, each manufacturer, has his own specific problem to solve and each must figure not only upon the new timber crop, fifty or sixty years hence, but upon how the hiatus between the exhaustion of the old supply and the maturity of the young plantations may be bridged. A maximum of logging efficiency is indeed essential but it must be supplemented by far-sighted study, by state and federal aid based upon a practical knowledge of the situation, and, most of all, by public education in the aim of a sane forest policy.

CHAPTER XIX

THE GREAT GOD COMPETITION

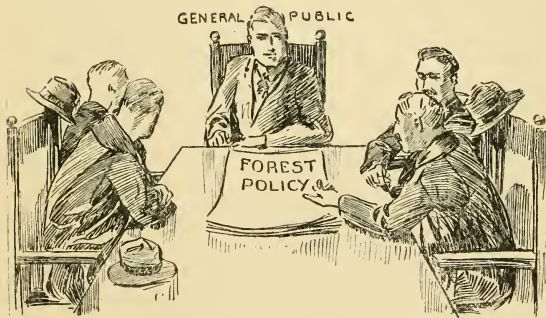
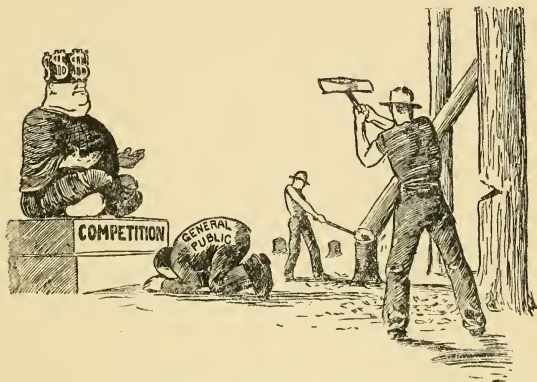
How competition hinders commercial forestry developments; the remedies at hand.

One of the greatest obstacles to the practice of conservative lumbering and reforestation lies in the restriction placed upon operating expenditure, a restriction directly due to competition. In spite of a great deal of talk and propaganda designed to spread a contrary opinion, both the lumber and paper industries are highly competitive, and as a whole they are no more profitable than any other business requiring equal ingenuity and similar risk. Past investigations of a so-called "lumber trust" have, on this point, rendered a clear decision. When general business is good, then people have money to build homes and factories, the railroads buy cars and ties, put in new bridges, etc., telegraph and telephone companies extend their facilities, and the stimulation of commerce requires more paper and more boxes and crates for shipping goods. At such

times profits are often large, but every conservative operator knows that he must put aside part of those earnings to carry him over the slack periods when most concerns can hardly make ends meet and others are temporarily forced to shut down. Now suppose that Lumber Company A adopts a policy of scientific forest cutting, or sets aside a fund for reforestation, either of which plans might easily increase from fifty cents to a dollar or more the cost of every thousand board feet of lumber it produces. Its competitors, however, decide to keep on along the old lines. During good times, to be sure, if the A Company suffers no heavy fire losses it is gaining something for the distant future, but its cash reserves are lowered, and its competitors can easily under-sell it. In poor times the company finds itself in a weakened condition, and competition becomes so keen that the whole policy may be abandoned.

If any single state adopts compulsory regulation of forest cutting, the cost of production within its borders is increased above the level prevailing in other states, and, unless all neighboring commonwealths simultaneously pursue the same policy, the industry of the most foresighted is temporarily penalized. Such was indeed the case a short time ago when Pennsylvania tried to regulate the coal

industry. Having a practical monopoly on anthracite, there was comparatively little difficulty in-



Blind and destructive competition—or cooperative regulation—which?

volved, but at the prospect of regulating the bituminous industry the neighboring miners of West Virginia became so jubilant that the Pennsylvania legislature promptly changed its mind. The much celebrated law of competition became an incubus which threatened the whole conservation idea.

"But," we are told, "the heartless lumbermen *must* be regulated to prevent them from devastating the remaining forests. Let Congress pass a law for all the states and for all the lumber industry. Make a set of regulations, or several different sets applying to different sections of the country, and then tax everyone who conforms thereto at a merely nominal rate per thousand feet of timber cut. Make the non-conformists pay a tax ten to twenty times as high. That will bring them into line." Somehow or other Congress has not as yet waxed enthusiastic regarding this plan. If everyone must simultaneously adopt more expensive methods, the lumber industry will be obliged to shift the cost to the consuming public, and each congressional constituency will have something to say to its representative and its senator who helped pass the law. Our farming communities are fifty per cent. underbuilt and our cities all complain of a housing shortage because people cannot afford the cost of building materials. If Congress proposes to pass legislation

to increase that cost, the stigma of unpopularity is attached in advance. Thirty-three states, which include the great majority of the most populous and most powerful, are now dependent upon other states of the Union for their timber supplies. They cannot do business unless they get wood from the timber exporting states, but are they yet ready to pay higher prices merely to insure the continuance of that supply?

In order to do away with what are believed to be the false economies of competition, Germany stimulates the creation of trusts. There, the government in a measure authorizes a price high enough so that everyone finds it to his advantage to practice the most scientific forest methods. State forests, town forests and private owners all sell on approximately the same basis, and if it appears that a temporary over-production will necessitate cut-throat competition, the government and private owners together work out a scheme of exportation that practically means the dumping of the surplus upon foreign markets. Germany feels that the gains from international commerce and the continued policy of forest growing justifies the means employed. But how about ourselves? We abandoned this system some years ago when public opinion demanded the breaking up of the oil trust and other monopolies,

and we would hardly be willing to reverse the principle of the Sherman anti-trust law merely for the expectation of a future timber supply. The great god Competition is perhaps too zealously worshipped, but we Americans believe in that principle, and a sudden change from one extreme to the other is out of the question.

Only twenty-five years ago Sweden was confronted with a similar forest problem. Perhaps it was easier for a smaller country which had never suffered from the constitutional struggle between the rights of individual states or communities and the national authority, but she found a solution. The law there enacted approached the question from the community viewpoint, provided for teaching the people the essential importance of the forest industries, and managed to appeal to local pride in such a way that the necessary regulations and the rather bitter pill of increased cost appeared self-administered. Competition was not abolished but a coincident spirit of cooperation was inspired. We would do well to seek this as our own model.

During 1921 when over-production sharpened the edge of competition, hardly any two lumbermen on the Pacific Coast sold their product at the same price, yet, for the purpose of mutual fire protection, they cooperated, not only among themselves but

with the forest departments of their several states and with the United States Forest Service. Lumbermen's associations assessed their members in proportion to the amount of lumber produced, and turned over the money to the state and national forest authorities. As a result their lands were protected better than ever before. In California, moreover, this development is being carried still further. The Redwood Manufacturers Association has adopted a far-reaching plan, a policy providing for reforestation on a scale actually commensurate with the amount of timber cut. At this writing not all of the association members have fallen into line, but the work already done is at least an indication of the willingness of many lumbermen to cooperate in the solution of a public problem. North, south and east as well, the association movement in favor of a forest policy is growing. Lumbermen and paper producers are asking their various states to begin the promulgation of such regulations as will not too much penalize them under competition, but will nevertheless gradually work up to the point of simultaneous and consistent enactment. With other leaders in the conservation movement of the country they are petitioning Congress to encourage and assist the work in a manner similar to that in which the Federal government stimulates the construction

of good roads throughout the country. That is, if any state will adopt a forest policy which seems to the Secretary of Agriculture of the United States proper and adequate, and if such state will authorize the expenditure of sufficient funds to carry on its share of fire protection, regulation, etc., then the United States Government should make available to that state an equal or otherwise fixed amount. This is no new principle, but its supporters maintain that a broad application should avoid the undesirable limitations of the Weeks Law, and that the result will be slowly but surely attained. Although the handicaps of competition may cause delay, it should progress at least as rapidly as the people of the United States are willing and ready to pay the cost. In short, it involves no unpopular legislation by an authority which must spend millions for enforcement, but is a policy really self-imposed and self-administered.

Some say that cooperation is not natural to human nature, and even purport to believe that when men do cooperate it is only for the temporary satisfaction of a selfish aim. In a measure this is true, and means will have to be found to force the stragglers into line; but we cooperated during the war and united to build up from nothing a working and fighting machine so great that our army was at

least the deciding factor in a drawn game. When the majority of the people appreciate the very real threat of a fast approaching timber shortage and realize that this is an emergency very similar to war, cooperation will again be successful.

CHAPTER XX

THE ESSENCE OF SUCCESS

Growing the forests at the market; the taxation problem; public nurseries and experiment stations.

Although regulative measures, such as proposed in the preceding chapter, are of the greatest importance, they by no means solve the whole problem. Let the forests of the west gradually dwindle to the point where they are only sufficient to permanently supply a small surplus above the local needs; let the forests of the south be similarly employed, and if we can in the meantime gradually bring back into production the idle acres of the eastern and central states near the chief points of wood consumption, there will be enough for all. Our northeastern section now produces perhaps ten or fifteen per cent. of its total wood consumption. Experts say it can be made to yield at least sixty per cent.—and this without destroying a single productive farm, or taking away a single acre of land which could produce more revenue in other ways.

But how are we to set about it? Although we are making some headway with the creation of new forests through the wood-lot proposition, through the town forest idea, and through the efforts of the lumber and paper producers, the progress in these directions is still slow. If I pay three to four dollars an acre for suitable land (much of it could be obtained for less), spend fifteen dollars more per acre for planting and supervision, and add four per cent. compound interest to the total, the cost, without any allowance for the payment of taxes, will amount in seventy-five years to about two hundred dollars per acre, or fifteen dollars for every thousand feet of lumber grown. On the basis of present prices such a proposition would hardly pay, and there is the rub. But today's basis is not the deciding factor. During the last seventy-five years the price of practically all grades of lumber has nearly trebled. What will happen in the next seventy-five years when the great timber resources of the west as well as the south, are well-nigh exhausted or operated under some plan of conservative cutting which entails greater expense? Many substitutes will doubtless gain a hold strong enough to considerably decrease the per capita wood consumption, but new uses for wood are being continually found, the population is increasing, and a

gradual but nevertheless material increase in the price of wood products will be unavoidable. In due proportion to its necessity, forest growing *must* pay.

From the point of view of the private individual or corporation, however, the first step unquestion-



A number of progressive states have already passed legislation exempting, or assessing at a nominal value, such lands as are being held for the production of a new wood crop.

ably involves some means of equalizing the accruing burden of taxation. A short time ago a lumber company in the south attempted by sparing sufficient seed trees to promote a natural re-growth. After the completion of logging operations the local tax assessor visited the property, saw trees

growing thereon, and apparently deciding that this was productive rather than unproductive land, assessed it at a high figure. Appeal was in vain. The company was forced to cut down every tree, large and small, and, since the cost of getting out the few merchantable logs would have been greater than the revenue obtained, they were simply left to rot where they fell. The assessment was then reduced to a nominal figure. Instances of this character have occurred in several different states. Massachusetts, Pennsylvania and several other progressive commonwealths, however, have already passed legislation assessing at a nominal value or exempting entirely such lands as are either naturally or artificially to be re-stocked, and providing that when the new wood crop is eventually obtained the state may recoup itself by taking eight or ten per cent. of its value. This way of handling the problem does very well for the states above mentioned, wherein the gradual cutting of the forests took place simultaneously with a great increase in general manufacturing which could be taxed in turn, but where such other sources of revenue are lacking, the problem is not so simple. If a large proportion of the lands in a given county are suitable only for timber growing and cannot be taxed until the crop matures, the main source of public revenue is cut

off, and where will the money for schools and roads come from?

In Louisiana all timber lands are classified at fixed periods according to the number of thousand feet of timber per acre growing thereon, and taxed accordingly. If any person owns cut-over land suitable for tree-growing and is willing to enter into a contract whereby he is to carry on proper reforestation, the state in turn agrees that during the life of that contract it will tax the property only as bare land, and at the rate in effect when the contract was made. That this scheme is workable has already been shown by the progress in reforestation made by one of the large Louisiana lumber companies, but it may well be capable of some revision. Moreover, the permanency of the idea here depends upon the outcome of a race between forest cutting and forest growing. The law must sufficiently stimulate forest growing before the remaining forests are cut, or there will be no source of future revenue. A good example of this very catastrophe may be seen today in Michigan, which, through non-adoption of a policy to encourage forest growing on its cut-over area, is now for the most part unable to collect anything therefrom, and every tax period finds increasing thousands of acres uselessly advertised for sale.

Another way of handling this problem is similar to that at present in vogue in England. All land, whether it is suitable for general agriculture or only for forest growing, is assessed on the basis of the average rate of income it is capable of producing.



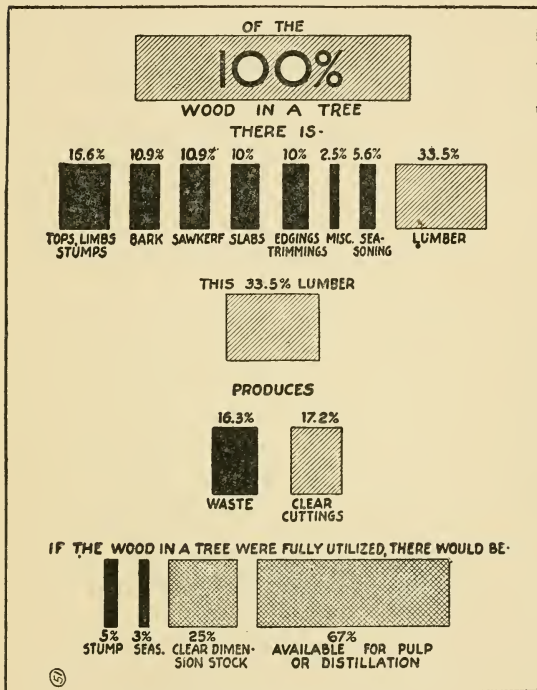
It is the poorest sort of economy to grow trees at great expense and then burn on the rubbish pile more than half of the wood content.

Not the sale value but the producing capacity is the basis of taxation, and the rates, fixed at a percentage of this possible or probable revenue, are paid by the owner whether his land is actually worked or not. The proponents of this scheme rightly claim

that it tends to keep all land at the maximum of production, but, verging as it does on the theory of a tax on income rather than a tax on real estate, there is a decided element of guess work and many opportunities for injustice arise. The difficulty of applying it to our own idle land problem is that we have no sufficiently well established standards of forest production. Lumber prices have been slowly rising over a period of many years; we believe they will continue to do so, but, because the natural law of exhausting supply is interfered with by many factors, we cannot be sure just what to expect. There is, therefore, no one solution of the taxation question applicable to the whole United States. Separate political units will have to handle the problem each in its own way, reconciling so far as possible the necessary financial requirements with a maximum of encouragement to timber growing.

Other difficulties arise quite aside from the question of taxation. We require a comprehensive plan for supplying the seedlings to be planted, and a thorough scientific study of methods of reforestation, with a view to meeting the varying natural conditions found in the different states. The nursery or seedling problem is important because comparatively few trees can be grown through the sowing of seed on idle land—the wastage is too

great. Nature indeed can afford to follow this method, but man must usually sow tree seed in specially prepared beds, set out the seedlings in



Lumbering is today a wasteful operation.

cultivated ground, and not until they are two or three years old may he safely transplant them to a permanent location. The most efficient nursery results are obtained from rather large scale operations conducted by experts at a cost which private owners, with only a temporary need to satisfy, can hardly afford. The seedling supply, therefore, becomes strictly a problem for some central body, preferably the state. However, the national government has also a particular interest in encouraging tree planting by all the people, and national cooperation with the states to promote the best and most effective nursery methods is believed to be the most desirable solution.

Scientific study of planting methods is vitally necessary. Where should pine be planted? Where will hardwoods give better results? Of these general classifications what particular species will best thrive in any given locality? With effective fire protection three-fourths of our cut-over lands will reforest themselves, and perhaps the greatest problem is to determine where not to plant at all but let Nature attend to the work in her own way. Should the brush left behind by previous operations be burned or merely scattered? Perhaps it will actually pay to remove it entirely. These are all questions requiring careful experimentation con-

ducted by some central body. The United States Department of Agriculture already maintains six Forest Experiment stations, two in the south and four in the west, but their work has been handicapped by insufficient appropriations. We need an extension of experimental work; in particular we need one or more stations in the northeast where the reforestation movement is gaining considerable momentum. The expenditure of money on wrong methods is the greatest blow at true progress.

And lastly we must attempt to develop a market for wood now wasted during the processes of lumbering and manufacture. It is the poorest sort of economy to grow trees at great expense, and then throw away more than half of the wood content merely to obtain a few good boards. Yet that is exactly what happens today. We have seen that, if the lumber industry were located nearer its market, a considerable improvement in this situation would naturally follow. But it is not enough. The United States Forest Products Laboratory at Madison, Wisconsin, pays a great deal of attention to the wood utilization problem and has been most beneficial to the whole country through its experiments in finding new ways to use the odds and ends from logging and sawing operations. If we are to maintain our present standards of living, wood prices

must be kept at an absolute minimum, and to do so utilization of every branch and twig, of every slab and sawdust pile, must be the goal.

CHAPTER XXI

A TREE FOR A TREE

The part of every good citizen.

There are two ways of handling any great public problem—Revolution and Evolution. Small groups of people are continually planning to cure all the world's evils by a sudden cataclysmic change, wiping out all the old and beginning upon an entirely new basis. They become quite adept at destruction, but the mind that is big enough to construct a complete government, or even, in the present complicated commercial system of the world, to evolve in its entirety a permanent forest policy for the United States, has not yet been discovered.

"Keep out fire and plant trees!" That is easy enough to say. "It is not up to us; let the federal government and the states do it." Democratic government will not, and cannot, take action unless a united public opinion demands it. Two comprehensive forestry bills have already been introduced in Congress but without favorable result. Why? Because as to methods of regulating the lumber

industry, as to the problems of taxation and the details of forest administration, our legislature simply lacks united support and therefore does not know how to proceed. One school of foresters says "Do this," another "Do that." Unanimous in their desire for forest conservation and extension, our experts cannot agree on any program covering the means to be employed. While they dispute, forest destruction continues.

Forest policy or no forest policy you and I must have wood. We do not necessarily have to choose blindly between warring factions. We must learn enough of the fundamental facts to demand an effective compromise. No one now disagrees upon the matter of the fire hazard; fire protection is a policy in itself. No one now disagrees as to such extension of our National and State Forests as is clearly practicable. No one disagrees as to the general policy of encouraging corporations, towns and private individuals to plant trees. Is your own state taking action along these lines? Are you so whole-heartedly in favor of the movement, that you are willing to assume your share of the responsibility and your share of the cost?

There are 245 million acres of cut-over forest land widely distributed in many eastern and southern states. Most of this is still sparsely timbered,

but in addition there are 81 million acres of land absolutely denuded and idle. Just the other day, perhaps, you drove your car through one of these districts. "How terrible!" you exclaimed, and passed on as quickly as possible. Your state or your



A Forest Policy in six words—Keep out fire and plant trees.

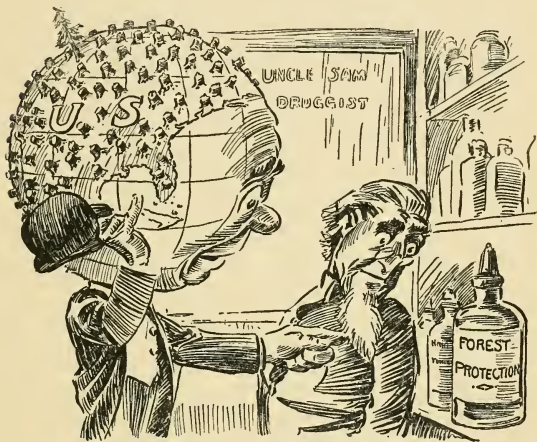
town could probably purchase this area for a small sum, plant trees again, protect the land, and in due time begin to furnish good lumber. Perhaps a lumber company still holds title to that waste. That company will not run the risk of re-planting because you or your friends may throw out a half burned

cigar and set the underbrush alight. You cannot force others to grow timber for your benefit unless you are willing to offer your cooperation and assistance to the extent of making it economically practicable for them to do so. You want lumber without having to pay the cost of bringing it across the country. Well then, you must put yourself in the place of the grower and permit him to make a safe and reasonable profit.

Perhaps you own a small wood-lot on your farm or your country place and you cannot now sell its product because there is no local sawmill, and the lumber yard nearby, accustomed to buy Pacific Coast timber from regular wholesalers, is unwilling to cater to your "whim" and help you out. Do you therefore clear the land for firewood and then neglect it, or are you a booster for the town forest movement and the private wood-lot idea, with the knowledge that, if others are confronted with your problem, the sawmill and the market are bound to come?

A few years ago you seldom read in your ordinary daily papers anything about wood shortage or forest preservation, yet today practically every newspaper in the United States declares in favor of the movement for the perpetuation of our forests. They are printing articles telling of the

value of the forests to our people, of the necessity of forest fire protection, forest regrowth and re-planting; they are printing editorials regarding proposed legislation, and they are asking for action on



Here is a cartoon taken from one of our great metropolitan dailies showing how the newspapers of the country are conducting educational work for a forest policy.

a forest policy. All this is largely the result of an educational campaign now conducted by the American Tree Association, which has as members many thousand citizens devoted to the perpetuation of our forests. During 1921 the Chamber of Com-

merce of the United States appointed a committee to consider the whole forest problem. That committee spent many weeks investigating various conditions throughout the United States; it held public hearings from New York to California, and lumbermen, wood-users, lawyers, tax experts and economists gave testimony. No greater opportunity ever existed to acquaint the business men of the country with the true state of our forest affairs.

You read these articles. You feel that you would like to see something done, that you would like to know more about the forest problem, but you are too busy to pursue that knowledge. Suppose that when you were in school you had been taught, the way European children are, the importance of the forest, and the fundamental theory of growing wood for commercial purposes. There would be no forest problem today. Does your state now require in the public schools a compulsory course on the value of trees and how to protect them? Are you an active backer of such a law?

Federal legislation to co-ordinate the efforts of states, towns and individuals will come when the whole country is ready for it, when the public knows what it wants and unitedly demands it. Books and newspapers must continue to preach forest preservation and extension; industries and advertisers must

be made to realize that they have an important share in the responsibility. For every American the goal is, in short, to obtain "a tree for a tree." This is the battle cry of the homebuilder, of wood-users all over the country, and this is the slogan which alone can assure us of a permanent wood supply. Let us individually adopt that slogan as our own.

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